

ELECTRICAL CONSTRUCTION AND MAINTENANCE

With which is consolidated *Electrical Contracting*,
The Electrician and Electrical Record... Established 1901

A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering installations, repairs, maintenance and management in the field of electrical construction and maintenance.

April • 1948

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ELECTRICAL CONSTRUCTION and MAINTENANCE. Published monthly. Price 35 cents a copy. Vol. 47, No. 4. Allow at least ten days for change of address. RETURN POSTAGE GUARANTEED. Publication office, 99-129 N. Broadway, Albany 1, N. Y. All communications about subscriptions should be addressed to J. E. Blackburn, Jr., Vice-President (for Circulation Operations), Electrical Construction and Maintenance, 330 West 42nd St., New York 18, N. Y. Subscription Rates—U. S. and possessions, \$3.00 a year, \$4.00 for two years, \$5.00 for three years. Canada \$4.00 a year, \$6.00 for two years, \$8.00 for three years. Pan American countries \$6.00 for one year, \$10.00 for two years, \$12.00 for three years. All other countries \$15.00 a year, \$30.00 for three years. Please indicate position and company connection on all subscription orders. Entered as second class matter August 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Copyright 1948 by McGraw-Hill Publishing Company. Cable address: "McGraw-Hill, New York." Member A. B. P. Member A. B. C.

APRIL, 1948

LIGHTING SPEARHEAD

FLUORESCENT LIGHTING is barely ten years old. In those few years lighting practice has changed amazingly. The values represented by a modern lighting installation, at the same time, are of an entirely new order of magnitude. Fixtures and lighting components, once a modest percentage of the wiring job, now run into big figures often exceeding all the rest of the electrical work.

IT IS NOT SURPRISING that many shrewd and agile minds are working overtime trying to isolate this new business from conventional distribution channels. Their plans almost invariably include some device for shouldering the electrical contractor out of the big orders. With astounding nonchalance they choose to complete the equipment sale and expect the contractor to be content with the installation. Such sales are always rationalized as more effective sales effort than contractors usually put forth. They are made, however, at contractors' net cost so talk of more effective sales effort is nonsense.

BY SHORT CIRCUITING the contractor, lighting fixtures can be sold cheaper on any particular job. By thus eliminating the greatest number of potential salesmen from the business, lighting is expected to prosper beyond our fondest dreams. Such idiotic logic will, of course, bring its own destruction in the market place. But a new, vital market like lighting is today deserves more intelligent development. Furthermore, there is no reason why the industry has to follow a ruinous policy to learn the obvious.

WE CANNOT AFFORD to approach the lighting market with less than our total sales resources. By far the largest body of sales personnel and the greatest sales potential in lighting are the electrical contractors and their experienced staffs. They are the only large group equipped to take the products of the industry and apply them usefully to the customer's needs. The potential market cannot be exploited effectively by selling engineering, lighting fixtures or the labor of skilled wiremen in their installation. It can be reached by selling a complete planned lighting package. The electrical contractor alone can sell and deliver such a package. Who else?

PLANNED LIGHTING NEEDS a unified policy. It also needs a clear understanding of effective distribution and sales tactics at the customer level. Some one group must take over the dealer function and that group must be in a position to command the full support and backing of the entire electrical industry.

LIGHTING AS A BUSINESS of tremendous opportunity is still new. Everyone wants to get in on the ground floor. Some of the dips in lighting activity and the growing pains of distribution policy ought to be a warning. The industry needs an expansive distribution and sales policy to exert the largest possible sales effort. We are convinced that the electrical contractor is the logical spearhead of any effective program.

Wm. F. Stuart

ELECTRICAL CONSTRUCTION AND MAINTENANCE

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hot spot
your customer
wants to
ventilate...**



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WIRING • LAMPS and LIGHTING • COMMUNICATION • SIGNALING • VENTILATION • CONTROL • POWER APPARATUS • TOOLS



Bullock's . . . of Pasadena

Six 500 kva. transformers serve power, lighting, air conditioning, and heating and special electrical services in this completely electrified department store. Electrical work by R. R. Jones of Pasadena is characteristic of modern electrical construction techniques.

By W. A. Cyr

IN the old days the carriage trade rode to town to do its shopping. Today many "towns" are so crowded with vehicles that the shopper has been discouraged by traffic. She began to shop at neighborhood centers near her home. And now the large department stores, sensing this trend are building large stores nearer to its shoppers. This is particularly true in the decentralized and spread-out Los Angeles area.

One of the most spectacular stores of this type is the new Bullock's-Pasadena, which looks more like a country club than a department store. It has perhaps the most complete electrification of any similar institution in the country. It is not only a super lighting job, but is electrically heated and cooled as well. And electricity is called upon lavishly to do all manner of services in addition. Electrical contractor R. R. Jones of Pasadena, was called upon to meet electrically the demands made by its creative designers, decorators and engineers.

These were Walter Wurdeman and Welton Becket, the architects, and their engineer Paul Sessinghaus. Raymond Dexter, Bullock's top interior decorator and designer, collaborated on interior planning and color. D. N. Herwit of Solar Lighting Fixture Co., Los Angeles, created its unique fixtures and lighting design. Its air conditioning was in-

stalled by Western Air & Refrigeration Co. Hilberg-Byler-Hengstler were the mechanical and electrical design engineers. P. J. Walker Co. did the construction. Standard Cabinet Co. did all the Cabinet work.

First a word about its location and general character, because these influence the electrical and lighting design. Bullock's-Pasadena's 289,225 sq.ft. of space on three levels and a roof penthouse deck are sprawled in the center of an 8.2-acre plot between Lake and Hudson at Del Mar St. in Pasadena. This is a considerable distance from the main downtown section. On the plot itself there are parking facilities for 600 cars, much of this space being overtaxed by eager shoppers. To service this parking area are both a communications system and yard lighting that is unique.

Because of the gentle slope of the land the main floor or middle level is higher than the predominant street frontage on Lake St. The store takes advantage of this for a gardened terrace on the set back bank. This deprives the store of the usual show window but the designers more than compensated for it by making a large portion of the entire side facing Lake St. of Twindow glass. At night the entire area becomes a huge show window more visible to passing motorists than the conventional windows at street level would be.



Transformer vault containing primary switchgear and instruments and six 500 kva. Pyranol filled GE transformers 2,400 to 240/120 v., three for lighting, three for power. Switchgear is G-E Magnablast in metal-clad housing. Three separate sources of power are furnished by Pasadena's City Municipal Lighting Department with automatic throwover.

DISTRIBUTION SYSTEM

Into the transformer vault located at the northwest corner on the lower floor, Pasadena Municipal Light system brings three feeders from three different substation sources. Feeders are at 2,300 volts and feed six 500 kva. pyranol filled G-E transformers, three for lighting and three for power. Feeders come in through automatic interlocking transfer switches equipped with time delay. Switchgear is General Electric metal clad with air breakers rated at 5,000 volt 1,200 amp. Should there be failure in the potential on the preferred number one or number two incoming feeders, the second or third incoming line would automatically be connected in sequence. The total connected load is 600 amp. on the high side. An emergency lighting panel is fed directly off the secondary side ahead of the distribution switchgear. This feeds the emergency lights and the watchman and communications systems. Switchgear is operated by direct current supplied from a 100 amp.-hr. battery with its accompanying charger and control equipment.

The 220/120-volt single-phase from the low side of the transformers is fed through the main switchboards, which are dead front, dead rear, W. A. Benjamin Electric Co. boards using Westinghouse circuit breakers. In the power panels the motor starters are built into the boards and are accessible through flash front doors. The 4,000 amp. secondary power bus is a Westinghouse modified hollow square enclosed in non-magnetic housing where it goes through the walls between the transformer vault and the switchboard room.

The main switchboard has three cubicles, one for each

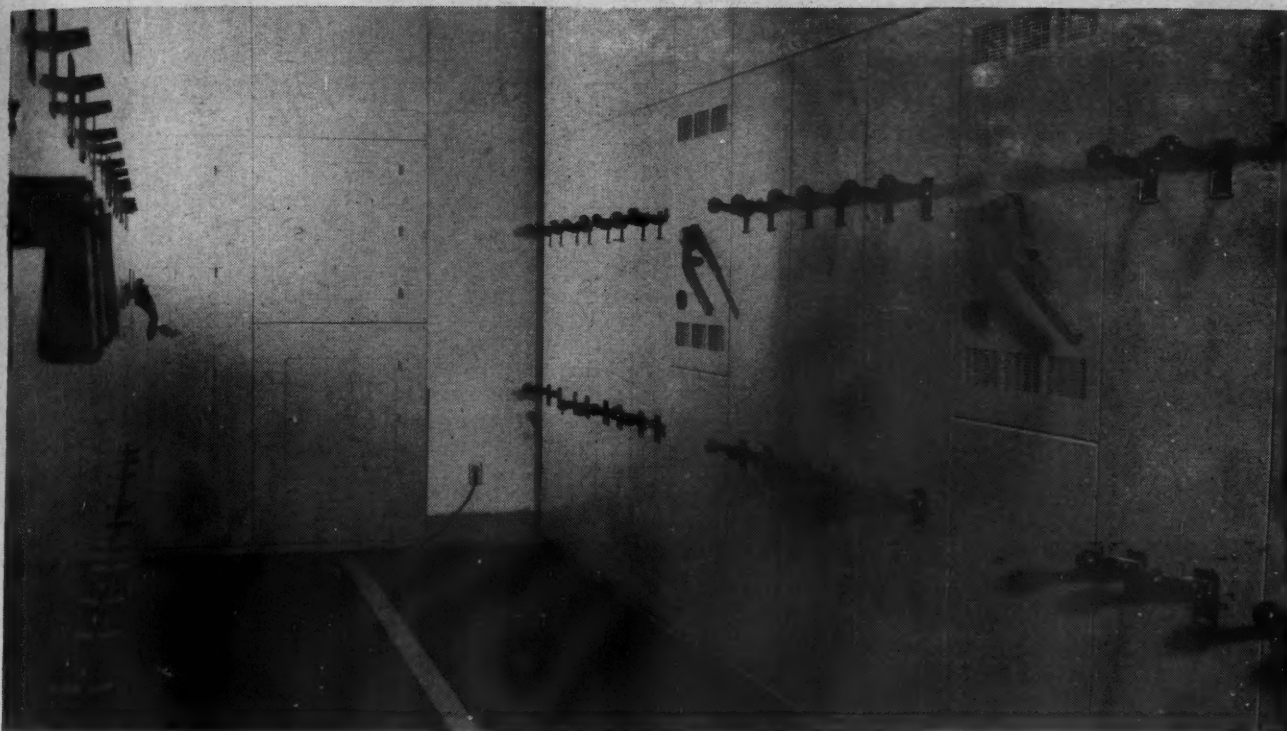
phase of lighting, with meters and relays, one power panel, a meter panel, the emergency panel, the panel to house the preferred line transfer equipment, and a spare.

Some idea of the loads can be obtained from the following. There is 700 kw. of connected lighting load. This is used in 7,000 18-inch fluorescent lamps, 1,500 24-inch fluorescent lamps, 3,000 48-inch fluorescent lamps, some 500 300-watt and 500 150-watt R-40 spot and flood lamps, and some 2,000 incandescent lamps. In addition there are outside floodlighting and parking lights etc. The power load is about 1,200 hp. in motors. This includes five 100-hp. motors on the refrigeration compressors and the heating elements in the air ducts in banks of from 7½ kw. to 60 kw. in some 30 locations.

Secondary distribution is carried along the basement ceiling in large metal ductways partitioned and equipped with racks and three and four-inch cubicles. Most of the feeders are 500,000 circular mil and some 750,000 cm. The contractor declares it was a good thing they were put in over-sized because the expansion that took place in the plans and requirements even while the building was being erected almost used up the spare capacity. There was double the number of circuit breakers installed over the original plans at the start of the job.

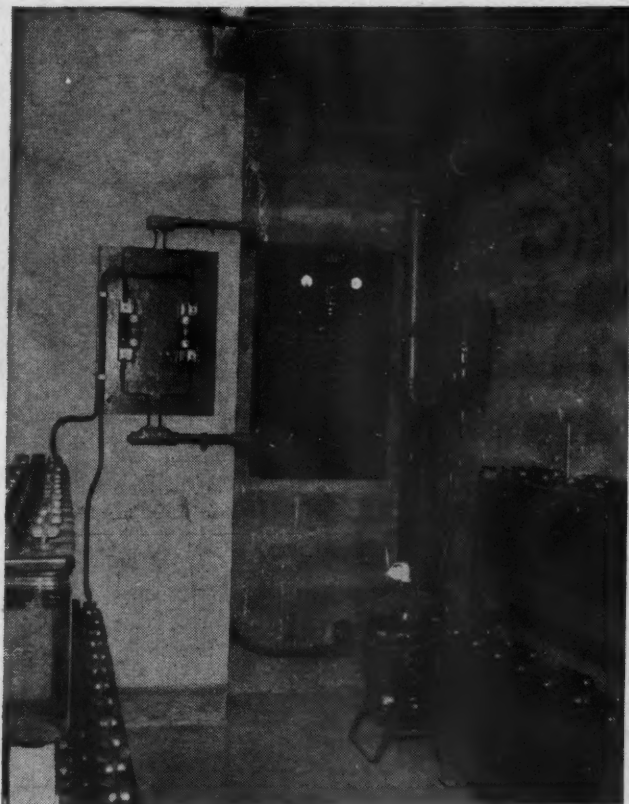
The ducts carry the secondary feeders to four riser shafts. At each floor level there is a closet in which are located panels for the telephones, signal system, power, the required number of lighting panels, emergency lighting, and relay cabinets. In lighting and receptacle circuits no wire smaller than No. 12 RE or RW was used, and all plug receptacles were equipped with a grounding pole. Considerable plug-in strip of the concealed flush type was used.

... BULLOCK'S of PASADENA

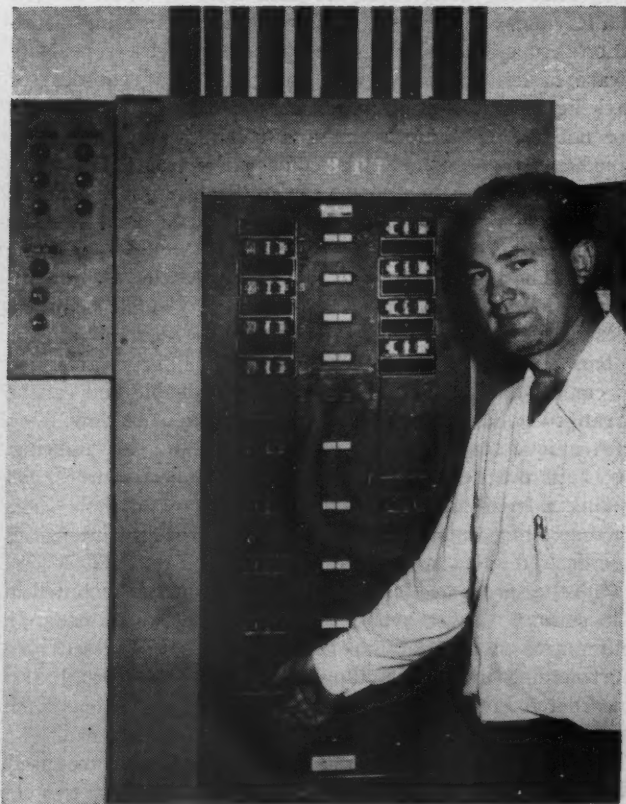


Main switchboard room adjacent to transformer vault is served by a 4,000 amp. bus. Switchboard room now contains almost double the amount of switchgear originally planned. It is made by Benjamin Electric of Los Angeles using Westinghouse deion circuit breakers.

Storage battery with charger equipment for energizing the switchgear and providing some emergency lighting at the switchgear.



One of the distribution riser shaft panel rooms. There are four riser shafts. Each contains panels for telephone signal power and lighting and some with emergency lighting.





OUTSTANDING ELECTRICAL CONSTRUCTION...

The counters are lighted by down lights coming through pin hole spots. The center fixtures of copper and lucite, having a low brightness for ornamental appearance, conceal R-40 reflector floods to cover the mural walls. The cove itself is a combination of incandescent and fluorescent.

LIGHTING

Perhaps the most outstanding feature of the store is its lighting, which paradoxically is the least conspicuous feature. In fact it melts into the color harmony so perfectly that both are one and the same thing.

The lighting design was the close work of D. N. Herwit and Raymond Dexter. It was an engineered lighting installation throughout in order to keep the customers from being aware of lighting fixtures at any time. A great deal of back lighting is used which is from sources that customers are not aware. Fluorescent and incandescent were combined everywhere to give color correction. This was carried into the fitting rooms too so that the lighting in the outside areas and that in the fitting rooms would be the same and the colors of the garments etc. would appear the same. There are many glass window sections. For instance, in the better dress section, there is light behind a glass panel to give the effect of daylight streaming into the room. In the furniture department the light is arranged to come from behind cases which are movable and can be arranged with drapes to give an effect like a window.

A unique feature is that there is no show case lighting. It is all overhead lighting, all from hidden sources, yet giving a high intensity on the cases from pin hole spots in the ceiling or similar methods. Where high intensities are desired spots are hidden in ceilings or fixtures.

In other areas use is made of flush lens plates mounted in the ceiling. These are of Century or Corning lens. In other areas where similar lenses are used a glassed area surrounding the lens is illuminated to a lower brightness in order to step down the brightness between the lens itself and the ceiling. Such units are 24 and 30 inch in size.

Another unique feature is that small lamps are used. The philosophy behind this is that only a small area goes



The sun shop is on the lower level near the south motor court and has windows of large glass area fronting the street which can be seen at night by passing motorists. It has large windows facing the south and the motor court. Lighting here is designed to keep its sun-filled appearance.

dark if a lamp goes out and it is easier to replace 18 or 24-inch fluorescent lamps than the longer ones. This is contrary to the streamline idea but the management did not wish maintenance men going around the store with long lamps. The initial cost may be higher but the saving in maintenance is considerable. Long areas of lighting going out would also affect sales. Most of the fluorescent lamps are 18 or 24-inch length and only a few of the 36 and 48-inch are used and these are in the shop or industrial areas. The



... BULLOCK'S of PASADENA

A louverall ceiling light box is used in an interesting way in this passageway between shops in the home furnishing area. It has a low ceiling and thus the louverall ceiling light box provides illumination without glare. Circular down lights in the ceiling are equipped with Fresnel lensplates.



An interesting treatment of lighting in this middle level women's shop. The spot down light in the ceiling reaches the figure in the niche through a port in the overhanging canopy. Extra punch is given the articles in the niches at the right by built-in glass covered ceiling units.

majority of the R-40 lamps are 150 watt size. Even the coves are lighted in combinations of incandescent and fluorescent. The bracket or fitting room lights over the mirrors are the same, combining fluorescent and incandescent. Many areas have a combination fixture with two fluorescent units and an incandescent unit between them with directing lenses covering the entire assembly.

Dramatic effect lighting is also provided for by use of louvered spots in swivel housings that can be turned and

directed to hit a figure or some merchandise with high intensity lighting.

As previously stated there are no show windows but one large glassed area of the store itself becomes a show window at night. In this section a combination of fluorescent and incandescent lighting is used and R-40 lamps in swivel housings are directed at specific pieces of merchandise. There are also banks of fluorescent lamps on separate switching to flood a certain area as desired.

Another window area in the sun shop cleverly uses additional punch of R-40 lamps behind a decorative louver system and in swivel housings to provide extra illumination along the window areas during the daytime to simulate the entrance of sunlight no matter what the weather.

In the fur shop lighting predominates in fluorescent to give a colder appearance.

Lighting intensities range in footcandles from 20 to 60 or 70 on showcases.

Perhaps the most spectacular lighting is in the toiletry section which serves as the main entrance to the middle level. It is at this level that the automobile entrance in the north motor court has access. With a high ceiling and delicately toned murals on the walls here the central fixtures are designed of lucite and copper to conceal batteries of R-40 lamps which are directed upon the murals on the side walls while fluorescent and incandescent lamps in the coves above give soft illumination to the ceiling. The counters are lighted from pin hole spots and individual niches to display a single bottle of perfume are given concealed illumination. On the tea room deck terrace lighting was provided to create shadow effects of decorative quality. The units were concealed and directed across large circular ports in such a manner as to throw interesting patterns of shadow and light.

In the beauty studio ingenious use is made of circline lamps for a decorative effect around a circular pillar seat.



Four of the five 100-ton compressors for the air conditioning system. These are Westinghouse compressors and motors.

SPECIAL SERVICES

Air Conditioning System

With the large lighting load operating during all the daylight hours, plus the heat developed in the crowds of people in the store, and combined with a mild climate nearly all of the year around, the chief function of the air conditioning system is to remove heat from the building. However, provision is made to introduce heat whenever necessary on rare cold days by means of electric heating.

The air conditioning system was installed by Western Air & Refrigeration Inc. of Los Angeles, and includes all duct work, filters, blowers, refrigeration system, and automatic temperature control mechanism of a combined electric and modutrol control. The five 100-ton Westinghouse compressor units provide refrigeration for the chilled water circulation. This system is on the penthouse roof with accompanying evaporative condensers and blowers, circulating pumps etc.

In some 30 locations banks of from $7\frac{1}{2}$ kw. to as much as 60 kw. of Chromolox fin strip heaters are placed in the air ducts. The larger banks are arranged for three-step control actuated by contactors in the automatic temperature control system.

Individual room thermostats in particular sections operate the chilled water valves and the electric heating strips as required. They lock out the three-step chilled water valve for cooling and cut in the heating strips in successive steps.

Outside and return air dampers are controlled by thermostats in the ducts tied in with room thermostats. When the inside heat is sufficient, return air dampers start closing and outside air dampers start opening. A temperature of 65 deg. F. is maintained with no less than 20 percent outside air at any time during the store operation. Manual controls give 100 percent return air during the heating up period in the mornings. On the cooling cycle the dampers operate to provide less outside air on rising temperatures over 80 deg. F. outside.

Thermocouple temperature indicators in the chief engineer's office give temperature readings from 18 locations, five on each floor and two in the penthouse floor and one on the outside air intake. These are dry bulb temperatures and three wet bulb locations are likewise indicated to the operator.

Sound and Signal Systems

Sound can be used with a finesse not possible in many other stores anywhere. There is enough equipment everywhere so that at no time need it be blasted forth loudly.

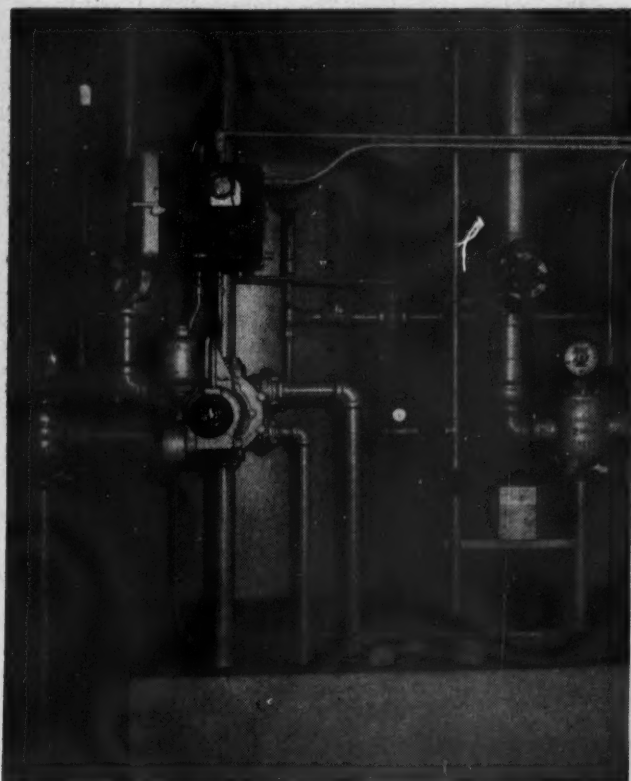
Purpose of the RCA sound system installed by Otto K. Olsen Co., another contractor, is to broadcast phonograph music and announcements over the entire building from the main control room on the top floor; (2) to broadcast over the entire system at any time, day or night, from the manager's office, by operating a key on a microphone stand; (3)



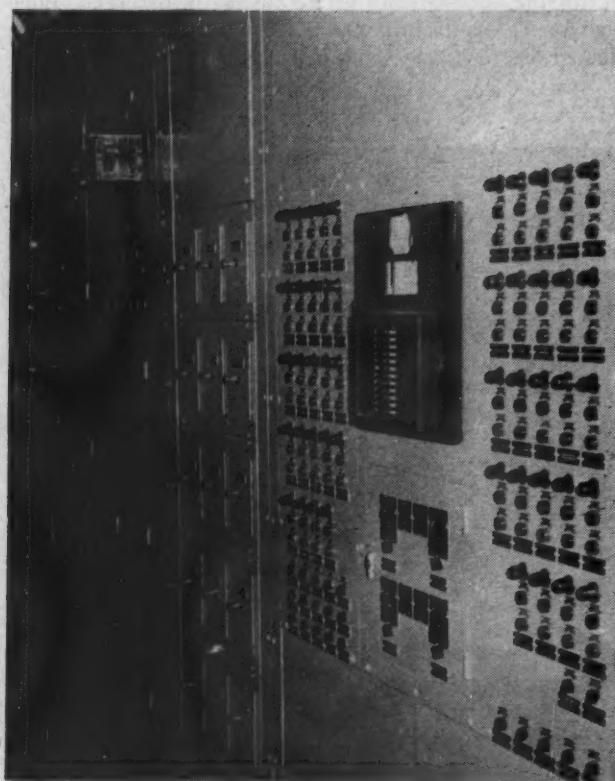
Inside the store Cannon fixtures of this type are mounted on pillars for the executives' call system.



The sound system is located in a separate room on the penthouse level.



Automatic electric operation of the Permutit water softening apparatus assures the ample supply of filtered water.



Main panel for air conditioning consists of manual controls, indicating lights and meters.



OUTSTANDING ELECTRICAL CONSTRUCTION...

The automobile parking court as seen at night with illumination of the trees and flowers from a modified mushroom-type of unit. The wide veranda is lighted from flush-mounted units behind Fresnel lenses in the canopy.

or to do the same from the telephone office where it can be used to operate a chime unit to denote time, or for "attention for call" signals. The system locates a speaker in every 40 sq.ft. of store area including the stock rooms, service rooms etc.

The amplifier and control equipment is located in eight metal cabinets, with locks on each, and two relay panels, one for the outside, one for the inside, in a special sound room on the penthouse floor. Here a professional type phonograph turntable is located as well as a microphone.

The turntable can take either standard or transcription sized records. There are five varacoustic microphones, one located in the manager's office on a stand, two on floor stands for use from microphone receptacles in the floor on the middle and top floor levels. There are two on position keys at the doorman's stands at each main entrance. An extra microphone is maintained at the watchman's desk near the service entrance. The night bell is located near by and is picked up on this microphone and carried throughout the store to the watchman on his rounds. Likewise the telephone bell is thus heard by the watchman.

Ceiling speakers are flush-mounted in baffles with ozite pads in the ceiling of the various areas, inconspicuously. By keeping a low level music can be played softly throughout the store without cross interference. From the main sound room circuits can be selected so that music can be broadcast to areas only where it is desired.

For the outside parking lots speakers are mounted on the tops of the lighting standards in a water-proof housing designed to concentrate the sound in a 360-deg. circle on the ground below. There are also projection type speakers around the building to concentrate the sound within a limited area at the back and the sides of the building to call chauffeurs etc. All levels are set low in order to prevent loud blasting of sound.

An idea suggested by Jack Cochran, chief maintenance engineer, has proved highly successful. A telephone with a long cord is mounted in a cabinet on the roof. An attendant during rush hours can be located at this point and can see the parking lots. He telephones to the gateman where there are vacant spots in the parking so that incoming

Standards for lighting the parking court also contain the speaker to call chauffeurs. Four lighting units are mounted on each pole. The mushroom lighting units for the garden plots are to be seen at the upper right.





... BULLOCK'S of PASADENA

Doormen have this equipment. A hand microphone connected to the sound equipment in the auto courtyard to call chauffeurs; outside telephone line, intercom phone to the store, and a special line to a taxi service.

Gatemen for the auto courtyard have a telephone by which the head doorman can reach him or by which he may be told where there are parking spaces available by someone located on the roof of the building.

motorists can be directed quickly to these vacant spots.

The head attendant of the parking lots has quite a switchboard at his control near the entrance to which he is assigned. He has switches for night lighting, the limousine telephone, an outside phone, intercommunicating phones to the south or other motor court and a microphone outlet.

All flood and parking lights and the canopy lights are remotely controlled through a contactor either from the motor court control panel or at the watchman's station.

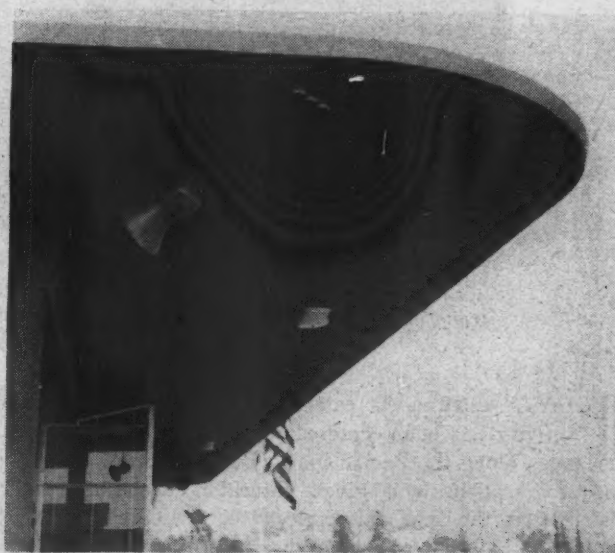
The signal systems also include a watchman's ADT connection, fire alarm system and a system of indicators on eight sprinkler risers to give a visible indication in the chief engineer's office should any fire sprinkler head open. Fire bells are located throughout the store and in the elevator shafts.

A novel system for calling store personnel and officials unobtrusively and without using a sound system is one which uses three lights of red white and green by which eight combinations are possible. These lights are located strategically throughout the building and in the stair wells. On pillars 180-deg. prism-type pilot lamps made by Cannon Electric were used effectively. In the stair wells an unobtrusive signal plate was made up of a standard outlet switchplate with three pilot light inserts.

Other Electrical Features

In addition to the electrical features enumerated many other applications are made. A vacuum tube system for carrying sales slips and cash is powered by two centrifugal fans with 75 hp. motors driving each.

The water system has a water softener which requires automatic motor operated valves on its 220-volt motors. There are sump pumps, boiler feed pumps, water cooler and compressor pumps and air compressors. The boiler is used to provide steam for pressing of clothing. On the boiler a



Executives may be reached unobtrusively throughout the store by visible signals. This is the way they are handled on the sundeck for employees. The sound system is also piped here as well as to all areas of the ground and store.

flame-eye smoke control is installed. In the cafeteria for employees the kitchens are supplied with Edison ovens, electric ice shavers, a York ice machine, electric roll warmers, and electric eyes are used on the doors through which the waitresses pass.

Superintendent for R. R. Jones, the electrical contractor, was Roy Holmes, who virtually lived on the job through its construction and whose ingenuity helped to develop solutions to many of the practical problems that arose from such a creative undertaking.

RELAY SWITCHING

Outlet box relays operated from low voltage control switches are a new approach to residential wiring.

By
W. T. Stuart



Electrical Contractor Charles E. Barnett, of Los Angeles, wiring 80 outlet home for E. S. Hart, holds low voltage transformer used to operate all relay solenoids.

RELAY switching is catching on. Activity has been centered pretty much along the Pacific coast. But once the equipment is given natural distribution, the approval of electrical contractors and the blessing of electrical inspectors, relay switching may greatly alter modern residential wiring practice.

Small solenoid operated switches mount in a knockout of the fixture or plug receptacle outlet box. The switch leads are connected between the switch leg and the hot wire as a single pole single throw switch. The control circuits from this point differ radically from conventional wiring practice.

The solenoid operating circuits are small No. 16 or No. 18 wires insulated for 24 volt service stapled to joists and studs. Power supply for relay operation is a heavy duty 24 volt trans-

former, usually rated 50 to 75 watts. Switches are momentary contact low voltage types, single or double throw depending upon the type of system.

One, "Touchplate", uses a momentary contact switch consisting of a relatively large rectangular button on a standard size plate. In this system only two wires extend from the solenoid coil to the switch. Operation is alternately "off" and "on" each time the switch is depressed. Square D's "Saflex" employs a small single pole, double throw, lever switch, automatically centering when released. With a three wire circuit to a double solenoid, this switch turns "off" when pressed one way, "on" when pressed in the opposite direction. Switches are silent and designed to fit standard switch plates.

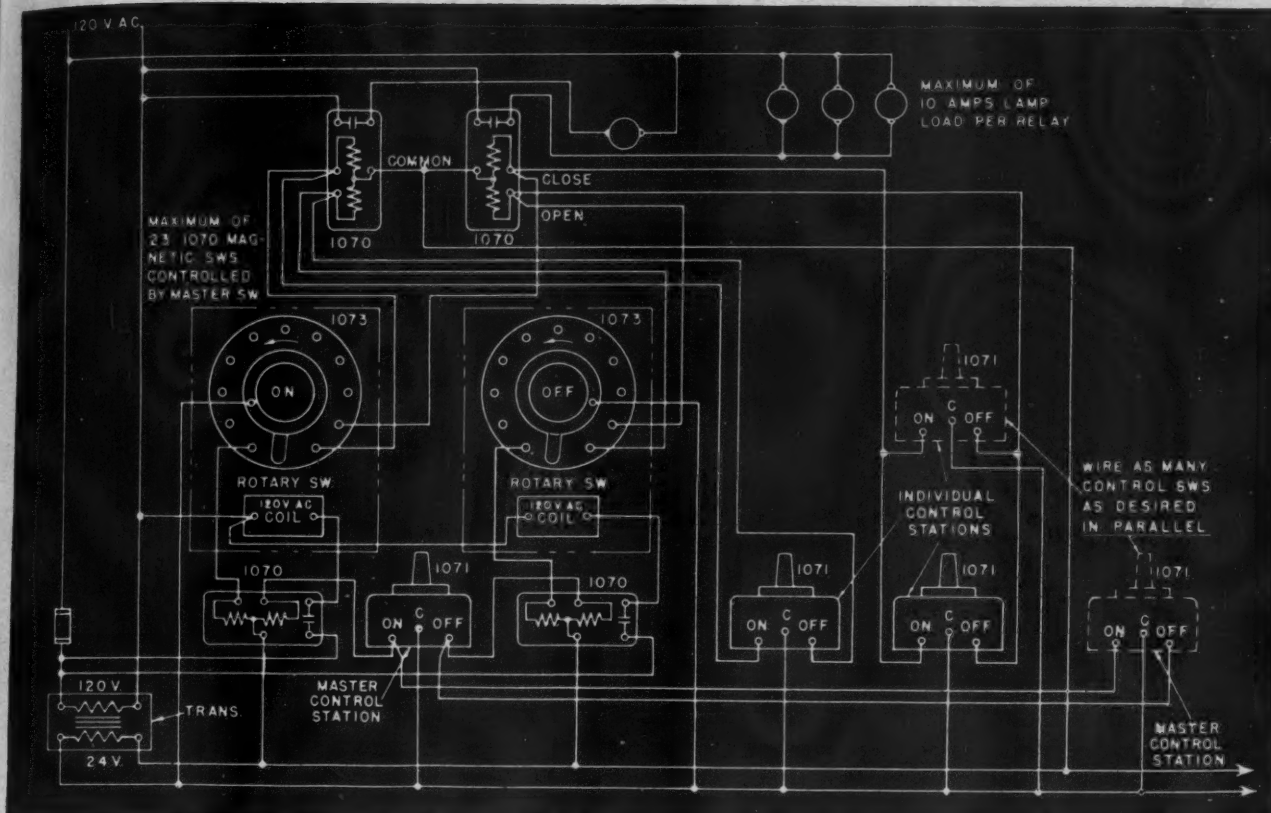
Switches may be mounted in stand-

ard boxes. Often, however, the boxes are omitted and the switches fastened to a 4 inch square plaster cover nailed along one side to a stud. The Saflex switch, $\frac{5}{8}$ inches deep, would barely project in even a shallow cover.

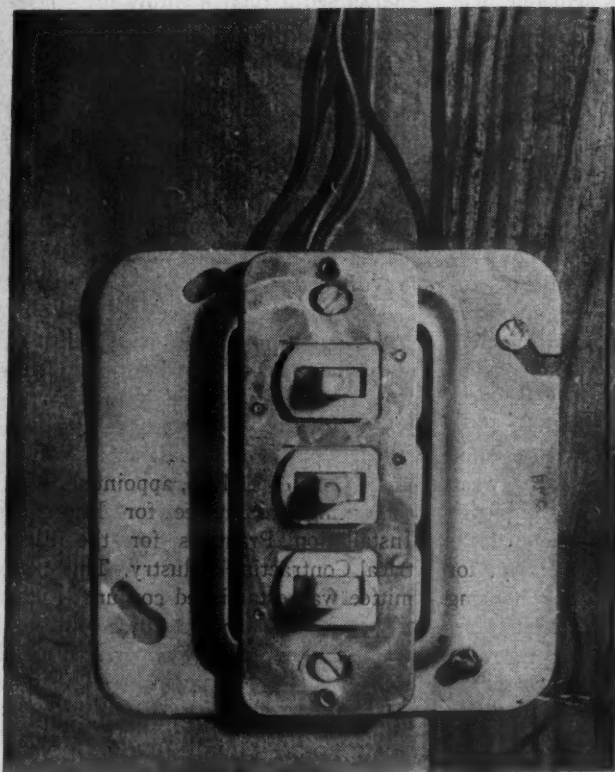
Color Coded two or three conductor cables are recommended for the control wiring. So far, however, there is no apparent standardization on wiring methods. The National Electrical Code permits wide leeway in wiring methods if the current is limited by proper overcurrent protection or inherent characteristics of the power supply transformer. (See Article 725, Remote-control, low energy power and signal circuits, 1947 National Electrical Code.)

With relay operation, a single outlet may be controlled from many points by simple multiple connection of the switches. Master switching can be easily introduced by a multiple contact relay. Saflex has an ingenious motor driven master control consisting of a rotary switch with 23 points capable of operating up to 23 switches by providing a momentary current in each solenoid circuit. The possibilities for interlock and sequence control circuits are, of course, endless and will probably inspire many new methods.

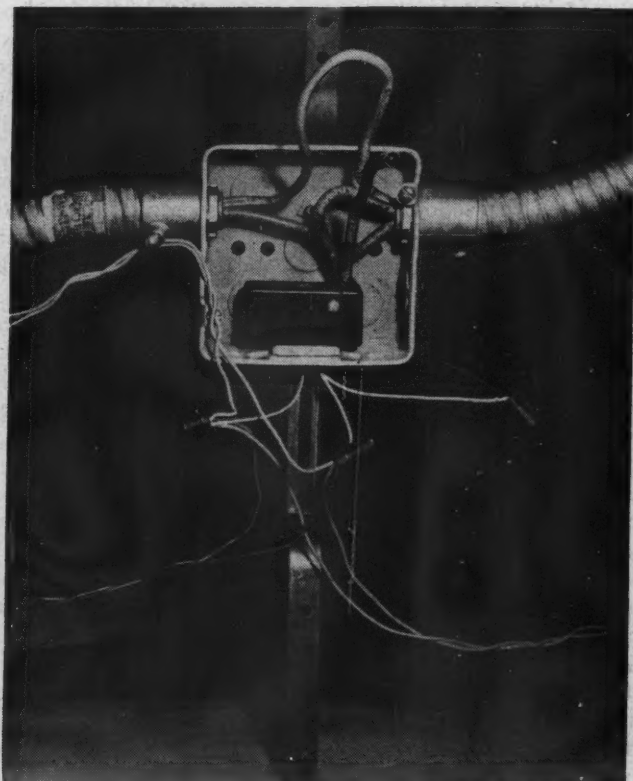
There are some claims current that relay switching offers substantial economies in house wiring costs. It is doubtful whether such claims can be substantiated on conventional wiring layouts. When the conveniences of the relay switch systems are properly exploited in wiring design, however, it is quite likely that real economies will appear. In conventional switching practice the cost per point of control rises rapidly when one outlet or circuit is controlled from more than one location. With relay switching the reverse is true. Cost comparison between relay switching and conventional switching becomes more favorable to relay switching as the wide flexibility and convenience of multiple control points is applied to the wiring plan.



Typical wiring diagram with master control switches, Square D Saflex system. Switches are momentary contact double pole. Relays are 24 volt solenoid-operated contractors in outlet boxes.



Switch installation on 4 inch square plaster cover, switch takes standard plate. Top switch operates room lights; middle, lights in next room; bottom, outside floods.



Installation of Saflex relay in outlet box showing low voltage connections for three points of control. Lever switches are automatically centered when released.

Accent On Production

Labor-management cooperation in the New York metropolitan area signifies a sincere desire to serve the interests of the public, the investor and the electrical industry.

By Denis J. Crimmins

Executive Secretary-Treasurer,
New York Electrical Contractors Association

CONSTRUCTION is being speeded and electrical construction economies are being achieved in metropolitan New York City with the unre-served backing of electrical contractors and Local 3 of the International Brotherhood of Electrical Workers. High-speed tools are in general use. Latest methods and management techniques are not only practiced but are being promoted through the frank interchange of construction know-how. This is a large-scale cooperative action, for nearly 400 electrical contractors and over 10,000 union members are backing this tremendous demonstration of public service. Outstanding in such a tightly organized area is this tangible evidence of labor-management cooperation.

The most recent visible proof of this accord is an "Electrical Construction Handbook" which contains the pooled installation knowledge of labor, management and manufacturers. Published by the Joint Industry Board of the Electrical Industry in the interest of disseminating data of general usefulness to personnel in the electrical construction field of New York City, the handbook contains scores of practical installation methods, useful charts, diagrams, tables, notes and hints for improving a wide range of electrical procedures.

However, the handbook is merely a means to an end. It is not an end in itself. Neither is it the sole evidence of mutual endeavor in this area. Rather, the handbook is symbolic of a cooperative spirit which has been gathering momentum for many years and which has been the recurrent subject for newspaper headlines, editorials and news broadcasts.

On January 14th, 1946, in dramatic contrast to the then-existent widespread labor strife throughout the country, New York electrical contractors and Local 3 of the IBEW announced that the entire weight of the Contractors Association and the Union would be placed behind the government's effort to speed the housing program. (*Electrical Contracting*, Feb., 1946). This announcement represented unprecedented cooperation between management and labor, for the pledge guaranteed that neither strike nor lock-out would interrupt the agreement for the duration of the existing housing crisis. The union also voluntarily relinquished its contractual right to time and a half for overtime and offered to work two seven-hour shifts, both shifts at regular time, until the housing shortage abated. In return for this pledge from labor, electrical employers inaugurated and sponsored a comprehensive program of workers'

social benefits, including hospitalization benefits for both husbands and wives, disability payments, and old age pensions which, in the case of men over 65, guaranteed a total monthly income of \$100.

Approaching the sensational was the fact that the Union urged "the use of the most modern technological methods and the unrestricted use of high-speed tools and devices" to carry out the program.

These pledges of cooperation by management and labor were not merely brave words.

To promote the free exchange of construction methods in the interest of mutual benefit, the Joint Industry Board of the Electrical Industry, representing both the New York Electrical Contractors' Association and Local 3 of the IBEW, appointed a Co-ordinating Committee for Improved Installation Practices for the Electrical Contracting Industry. This committee was established conjunctionally with the announcement of a Suggestion Contest, open to all journeymen, foremen and superintendents of Local 3. To encourage participation in this contest, a prize fund of \$6,000 was established, contributed equally by the New York Electrical Contractors Association and by Local 3. Instant response was more than encouraging. Hundreds

IDEAS PAY



\$\$\$

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420 Lexington Avenue, N.Y. 17, N.Y.

In an all-out promotional campaign, posters were prominently displayed throughout the metropolitan area in electrical shops, offices, industrial plants and on construction projects.



Suggestions were analyzed and evaluated by a Coordinating Committee including representatives of both labor and management. Suggestions of outstanding merit were recognized with cash prizes and Certificates of Award. Suggestions are still being solicited and prize-winning methods will be published at periodic intervals for inclusion in the loose-leaf handbook.

suggestions are still being solicited.

In addition to practical construction methods, the handbook includes useful charts, diagrams and tables. Notes and hints for job planning, general safety, low-voltage wiring, the use of rigging and tackle, tool check lists and other related subjects are included. The Coordinating Committee studied other specialty trades, compiling notes designed to promote cooperation with builders and inspectors.

Cooperation in preparing this material was obtained from many sources. Manufacturers contributed useful bulletins for inclusion. The Consolidated Edison Company permitted liberal use of their utility standards and instructions. Articles on particular problems were prepared by the Board of Fire Underwriters and the Department of Water, Gas and Electricity.

The true importance of the handbook, however, lies not in its content but in its significance. It again dramatically demonstrates that industry-wide cooperation is possible, practical and beneficial. Members of the Joint Industry Board and the Coordinating Committee, representing contractors and union interests, have spent countless hours together, frankly discussing trade problems. All who have attended these meetings have high praise for the obvious sincerity and good will.

The enthusiastic participation in the Methods Contest and the scope of interests revealed through the suggestions reveals a lack of petty suspicion, doubt or jealousy. The project shows a sincere desire to serve the public, the investor, and the industry as a whole.

Chairman of the Joint Industry Board is A. Lincoln Bush. Vice chairman is S. J. O'Brien. Executive Secretary-treasurer is Denis J. Crimmins. Board members include Natel Bedsole, Nat Chadwick, H. F. Fischbach, Albert Hassemer, Michael Hoffman, Herbert Josephson, E. A. Kahn, John J. Kapp, John K. Lapham, Louis Lidsky, L. C. MacNutt, Edward J. McAlinn, Edward P. McGonigle, Benjamin Salzhauer, Michael Siegel, Jere P. Sullivan, Harry Van Arsdale, Jr. and J. W. Werther.

Chairman of the Coordinating Committee is Louis Kalischer. Vice chairman is George Schuck. Committee members include Michael Hoffman, John J. Howard, Theodore H. Joseph, Louis Lidsky, Albert J. Mackie, Stewart McRoberts, Charles P. McGovern, George F. Price, Charles L. Scharfe, H. Ralph Teese, Harry Van Arsdale, Jr. and J. W. Werther.

of suggestions have been received by the Coordinating Committee for analysis and comparison. Monthly cash awards and Certificates of Merit have been and are being distributed to Union members for their suggestions of general usefulness.

Submitted suggestions cover the construction field thoroughly and, in addition, include constructive recommendations on such subjects as altering some provisions of the National Electrical Code, improving management-labor relations, and bettering manufacturing designs. While many of these suggestions were eliminated as impractical or non-pertinent to the objectives of the contest, the overall variety and seriousness of the recommendations were indications of sound thinking and a vigorous, healthy across-the-board interest on the part of labor. Other entrants indicated constructive thinking for, although their thoughts did not take the form of positive statements or solutions, they focussed attention on existent weaknesses and problems with the recurrent question, "Why isn't something done about this?" Such suggestions, concerning management-labor accord and for improving or producing various manufactured items, were referred to other authorities for further consideration. The remaining suggestions were again screened and

discussed in detail at meetings of the Coordinating Committee. At these meetings, suggestions concerning already-accepted and widely-used practices, methods that violated various codes, and practices that were wasteful of either manpower or materials were also eliminated.

The resulting collection of suggestions is therefore unimpressive from the viewpoint of total items. The purpose of the project, however, was not merely to compile an impressive collection of material. No historic or background material has been presented. Neither is there general information that can be found in many office reference books. It is not the purpose of the project to duplicate existing aids for office personnel but, rather, to improve actual installation efficiency and to assist those in the field and on the job in making on-the-spot decisions. This objective has been achieved.

To make this wealth of material available to the electrical industry, an "Electrical Construction Handbook" was published early in 1948 by the Joint Industry Board. Flexible ring-binders were selected so that additional material can be collected, published, distributed and inserted to augment the initially-released material. With the thought in mind of publishing additional helpful information at intervals.

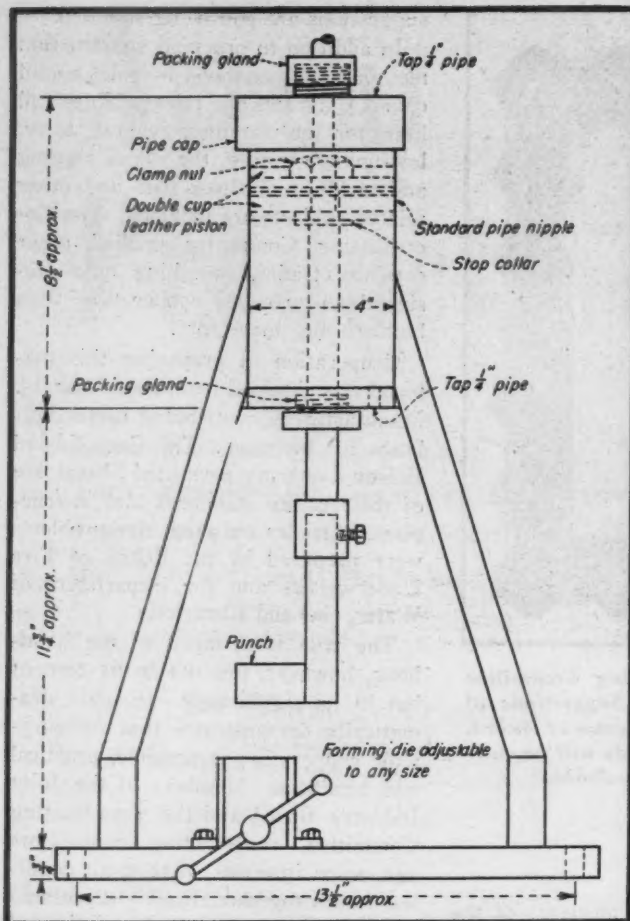


FIG. 1—Assembled view of air-operated blanking and forming press used to make wound rotor bar connectors.

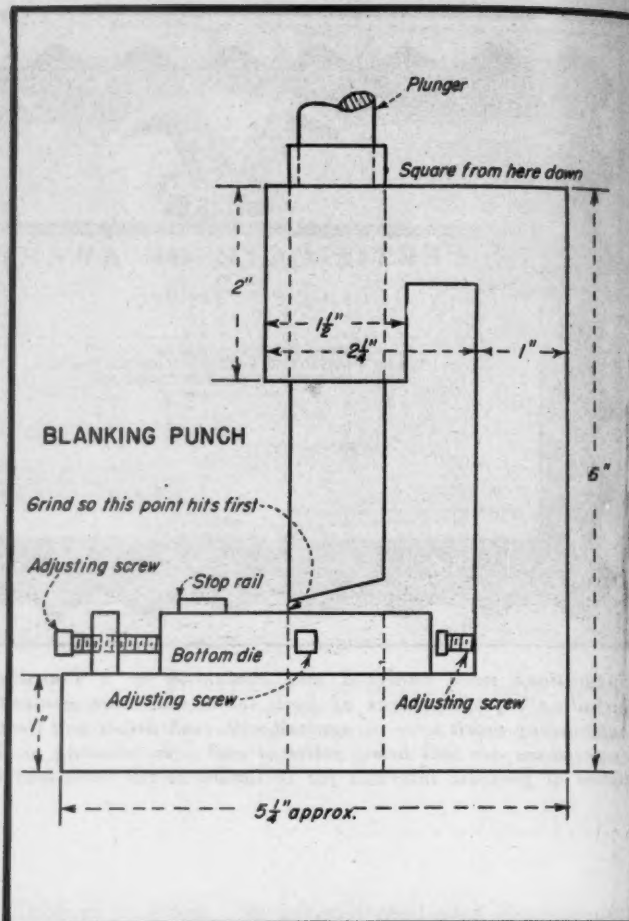


FIG. 2—Complete punch and die unit can be mounted on press base and operated by air cylinder.

Making Wound Rotor Bar Connectors

A shop designed punch press that cuts and forms copper wound rotor bar connectors in quantity; materially reduces rewind time

By William C. Bedoit
Chattanooga Armature Works
Chattanooga, Tennessee

A shop development awarded first prize in 1947 NISA Award Contest. Released through courtesy of NISA Award Committee.

MAKING copper connectors to join the top and bottom layers of windings in bar wound rotors is a chore that long has plagued motor repair shops. It is time consuming and chances are that no two jobs will require the same connector. Since our shop rewinds a considerable number of this type of motor, we attempted to correct this condition.

Our solution to the problem was the design and construction of a punch press assembly that stamps out the copper blanks and forms them into connectors of proper size and contour. Press construction can be changed in detail to suit almost any condition and it can be built of a variety of material such as might be found around any shop.

An assembled view of the unit is shown in Fig. 1. Power is provided by an air cylinder fabricated from a length (about 8 inches) of 4-in. pipe nipple. One end is enclosed with a standard pipe cap, the other is welded to a circular steel plate. Sturdy legs, welded to the cylinder and a 1/4-in.

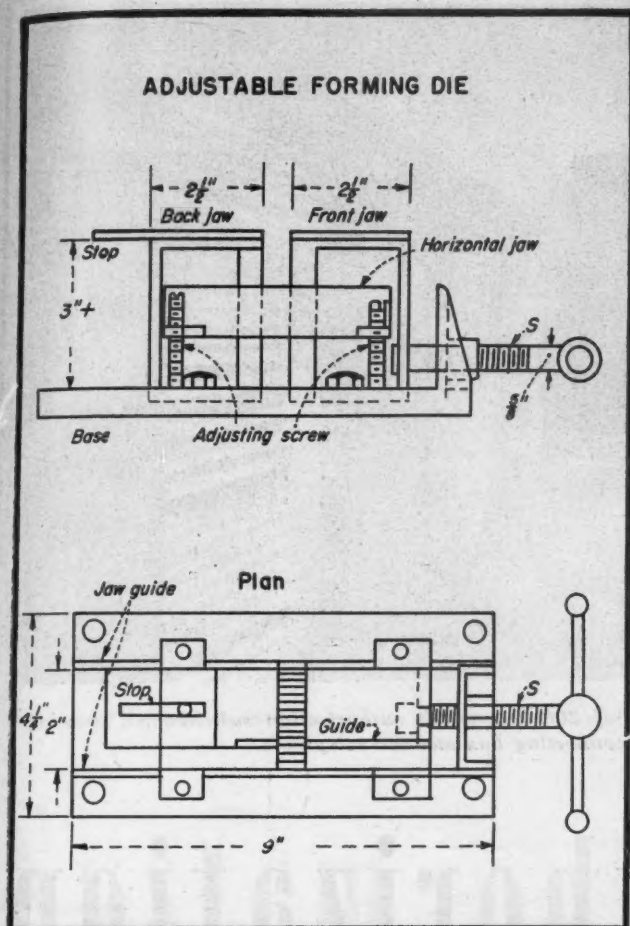


FIG. 3—Elevation and plan views of adjustable die for forming operation.

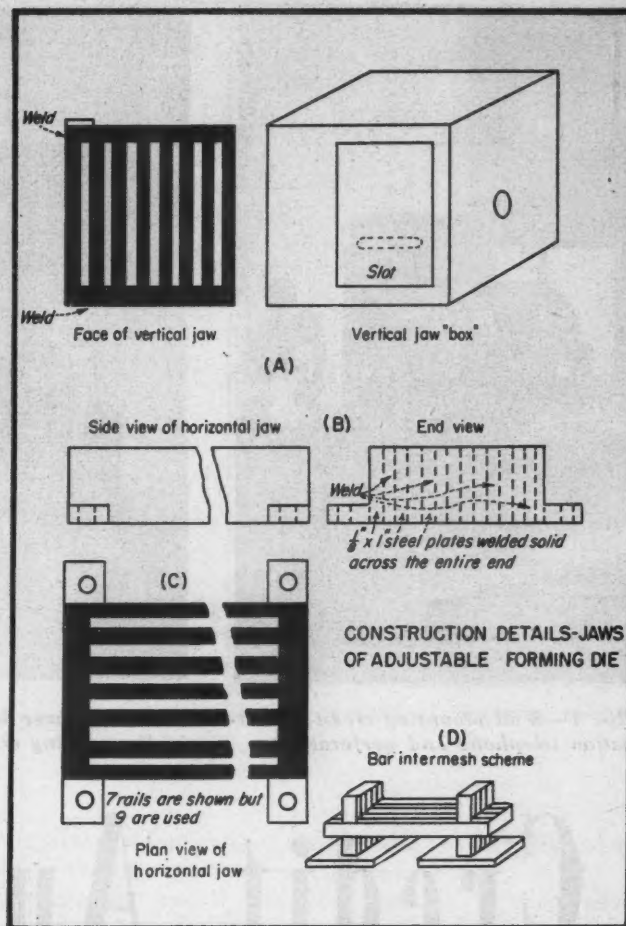


FIG. 4—Construction details of intermeshing jaws on the forming die assembly.

metal base plate, support the assembly. The piston is actuated by 100 pounds air pressure with motion controlled by a four-way valve that can be hand or foot operated. Double-cup piston leathers, sandwiched between two discs, are positioned by a clamp nut. Length of downward stroke is controlled by a stop-collar on the piston shaft.

Both blanking and forming operations are performed on the press. Each requires its own punch and die assembly which can be quickly attached to the unit. Where constant press operation justifies the expenditure, two complete air cylinders would prove most advantageous. Both operations could then be performed at the same time without waiting to change the setup. Production increase and time economy would result.

For the blanking operation, the punch and die assembly illustrated in Fig. 2 is used. The punch frame is mounted to the base of the press (replaces forming die shown in Fig. 1) and the plunger is connected to the air cylinder rod. The blanking tool is

fabricated from a square bar of tool steel ground to a good cutting edge on the lower end. After being properly aligned by adjusting screws, a steel die is bolted to the base of the punch frame. Guide bars position the copper strips on the die so they can be fed in rapid succession. After one end has been cut, the copper strip is turned around and inserted for the second cut. Completed blanks like those in Fig. 6 are ready for the forming operation. All the blanks for a complete rewind job are made before the press setup is changed for the crimping operation.

To reduce the expense and storage space required to stock a forming die for each size connector we might have to make, we designed one that has a vertical and horizontal adjustment for different connector widths and depths. Basically, the design embodies three grille-type jaws. Two of them are vertical and ride horizontally on a flanged base. The third is a horizontal jaw whose bars intermesh with those of the vertical jaws. All three are adjustable. The punch crimps the

copper strip in the opening formed by the three jaws.

Assembly and construction details are shown in Figures 3 and 4. The front jaw is boxlike in shape with a grille-type face (Fig. 4) constructed of eight pieces of 1-in. by 1/2-in. by 2 1/4-in. bar iron or steel. These are welded to the bottom and side of the front jaw assembly. The top is left open until the horizontal jaw is intermeshed. The back jaw has similar construction.

The horizontal jaw is constructed of nine pieces of 1-in. by 1/2-in. by 4 1/4-in. steel bars welded to solid end plates as shown in Fig. 4B and 4C. Ears for vertical adjustment bolts are welded on. The horizontal jaw is then placed over the vertical jaws with the bars intermeshing as shown in Fig. 4D. Top sections of the two vertical jaws are then welded on forming an assembly that cannot be taken apart. A clearance of 15 to 20 thousandths of an inch between each bar should be allowed to prevent the intermeshed

[Continued on page 110]



FIG. 1—Wall mounting credit authorization telephone and perforator.

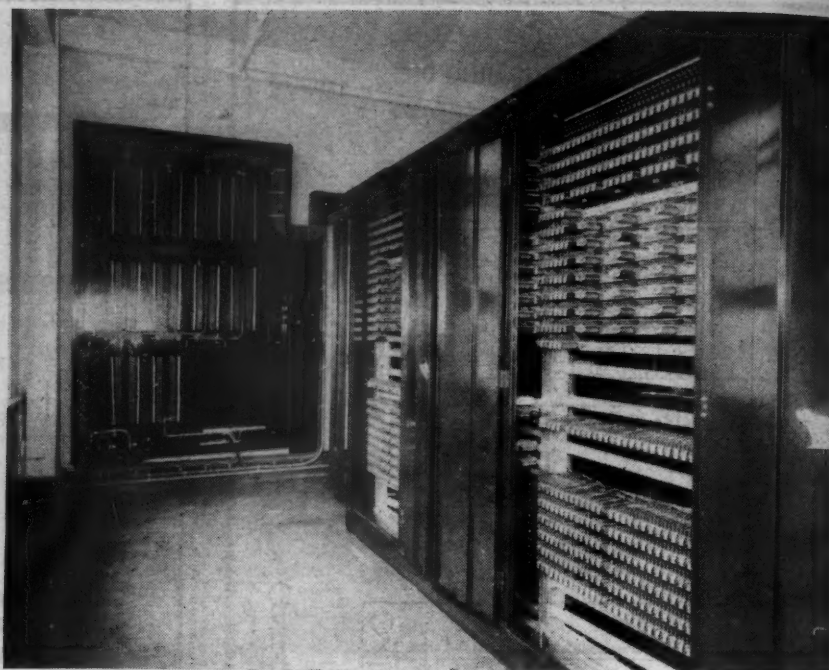


FIG. 2—Three bays of 200 line credit authorization switchboard, showing wall mounting cross-connecting box and test telephone.

Credit Authorization

A LONG step forward in modernization and efficient business management was recently taken when the well known Stern Brothers Department store in New York City installed a credit authorization system. The new system replaces the old method of sending sales slips through pneumatic tubes to the credit department for approval on charge accounts. The former method required from ten to thirty minutes for the return of the slip to the sales person, whereas the same results are now obtained from ten to thirty seconds.

Basically, the system is composed of an All Relay Telephone Exchange, the sales floor automatic telephones equipped with perforators, and the credit department turrets equipped with the automatic telephone and its associated perforator key control.

The system is initially operated by the sales person when a customer makes a charge purchase. Each credit telephone instrument is provided with a chart instructing the sales person in the proper method of dialing in order to obtain the person to secure proper authorization. The dialing has been

Electrical communication system eliminates pneumatic tube handling of charge sales slips in store.

broken down into eleven alphabetical divisions to correspond with the sections of the credit department ledger listing the customers' accounts. All copies of the sales slips are inserted in the perforating compartment of the instrument and the dial of the telephone is operated in the usual manner for calling the credit authorization clerk in the section corresponding to the name of the customer. The sales person tells the credit clerk all necessary details of the sale. The account is then checked and if found satisfactory the perforation control key is actuated on the turret which causes all copies of the sales slips to be perforated with an "okay" thereby completing the transaction. The customer may then take the parcel or make arrangements for the delivery of the purchased articles. The perforated sales slips are deposited in the cash register drawer assigned for that purpose after the amount of the charge has been recorded.

The calls may be transferred from the credit authorization clerks to their supervisors, and provision is made for supervisors to monitor the credit authorization clerks. The system is very flexible and may be adapted to any situation in the credit account field. Normally the traffic on this system is one way, i.e. from the sales floor telephone to credit authorization turrets, however, call back telephones are placed in strategic locations in the credit department from where the credit authorizer and supervisors may call the sales floor telephones.

The system was manufactured by the Kellogg Switchboard and Supply Company of Chicago, Illinois, and was installed by the Telephone Sales and Service Company of New York City.

The installation consists of 160 sales floor telephones with perforators, a 200 line Relaymatic switchboard and eleven, three-trunk credit authorization turrets. A wall type telephone and



FIG. 3—Pushbutton operated credit authorization turret and operator.

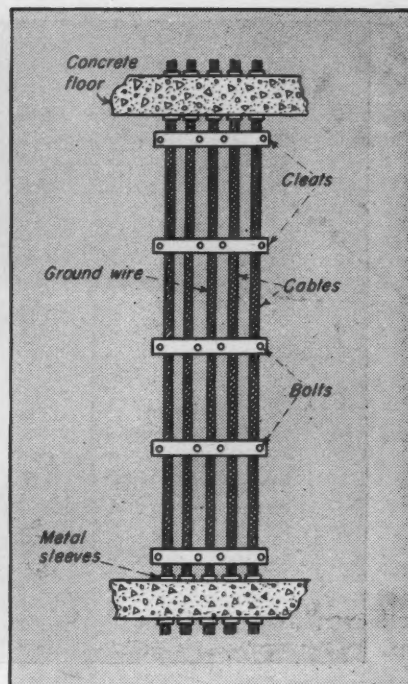


FIG. 4—Method of fastening cables.

System

By A. A. Schuhler

perforator is shown in Fig. 1. A three bay automatic switchboard is shown in the right foreground of Fig. 2, with the main cross-connecting panel and cabinet and its associated test telephone to the rear. A turret with control apparatus and its associated breastplate transmitter and headset with long extension cord is shown in Fig. 3.

All control apparatus and the telephone exchange are located in one room most of which is shown in Fig. 2. However, the rectifiers and the battery and rack are located to the rear of the three bay switchboard.

The main distribution cables running from the main terminal cross-connecting panel and cabinet to the terminal strip cabinets on the various floors are installed along the brick walls in a semi-exposed stairwell, but are protected against the weather. They are held in place by means of oak cleats, which in turn are fastened to the brick wall by bolts and sleeves. An illustra-

tion of this type of installation is shown in Fig. 4. Because of the shortage of lead-covered cable, flameproof insulated cables were used, however, they were first impregnated with Navy type insulated varnish to provide extra protection against dampness. A total of five cables were run consisting of three having 26 pairs of No. 22 gauge wire with 4 single No. 18 gauge wire, and two having 52 pairs of No. 22 gauge wire. The No. 22 wires are used for the telephone pairs while the No. 18 wires are used as the ground wire on the three wire system. In addition to carrying the aforesaid cables, the cleats also carry a No. 4 rubber covered stranded ground wire which runs directly from the water main in the basement of the building directly to the seventh floor where it is attached to a solid common ground bar in the main terminal cross-connecting panel.

Cables on the sales floors are of the standard flameproof insulated type, fastened by means of straps and concealed insofar as possible along moldings and on top of cabinets and store fixtures. This method of installation presents a very workmanlike appearance.

Terminal strip cabinets are installed on each sales floor wherever the main cables are terminated and branch wires are distributed to the instruments. In some places smaller cables are extended from one terminal strip cabinet to the

other and are also used for branching to nearby instruments.

Triplex twisted No. 19 gauge conductors are used for all instruments equipped with perforators. Duplex twisted No. 19 gauge conductors are used for the telephones without the perforators.

The power supply for the telephone system consists of a 48 volt dry plate rectifier which normally provides six amperes of current for the operation of the system and provides a floating charge across a 24 cell battery. Each cell has a 12 ampere-hour rating over an eight hour discharge period. The entire battery is supported on a two tier steel rack.

The power supply for the perforators consists of a 130 volt dry plate rectifier.

A control panel is provided for the eleven turret units and their perforator circuits. It consists chiefly of relays, fuses, pilot lights and resistors for each circuit, together with methods of indicating the actual condition of the system at all times. This panel is located in the upper part of a steel rack. The rectifiers previously referred to are mounted in the lower part of rack.

Conduit of the rigid and flexible types are used in the control room for running the wires and cables from the current supply feeder to the rectifiers, control panel, battery and through walls and floors as protection to the cables.



Photo A—Saratoga Springs, N. Y. half-mile raceway is illuminated by banks of floodlights mounted on high poles, projecting light against progress of race to keep shadows under and behind horses.

Outdoor Sports and Recreation Lighting Techniques . . . PART I

A round-up of layouts and lighting techniques for some of the more popular outdoor sports and games for recreation.

By Berlon C. Cooper

THE American public loves outdoor sports. Nearly everyone participates in one or more games as players at some time during their life. When unable to participate, they become ardent spectators. Outdoor winter sports are popular to a large degree, but come spring and wide interest is shown in all types of outdoor games for recreation and play.

After five years at war, and three more years of economic adjustment, the outdoor sports season ahead promises to be of greater interest for sports lovers than ever before. With over 60

million people working, there will be a big demand for night lighting of softball fields, tennis and badminton courts, swimming pools, volley ball and basketball courts, golf driving and archery ranges, playgrounds and many other types of play and recreation areas. Knowledge of how to best light each type of playing area is important, so that proper seeing conditions for both players and spectators may be provided. The following round-up of lighting techniques for outdoor play areas has been made to furnish such information. The layouts used are

based on sports lighting standards recommended by the Floodlight Section of the National Electrical Manufacturers Association, and were prepared by a special Technical Committee of that group after careful study of lighting techniques already used successfully on many installations, and of the many factors involved in the lighting of each type of play area.

Baseball and football lighting are not included in this round-up. The lighting of these major sports requires skilled engineering analysis based on existing conditions at each field in most cases. Therefore equipment manufacturers should be consulted for information and individual layouts on major installations of this type. NEMA Sports Standards layouts are available for guidance, however, and can be secured direct from NEMA floodlight equipment manufacturers for preliminary study on each project.

Floodlights are used to provide night lighting for nearly all outdoor sports.

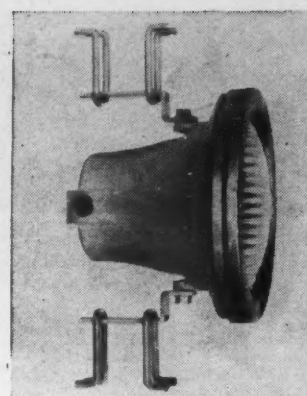
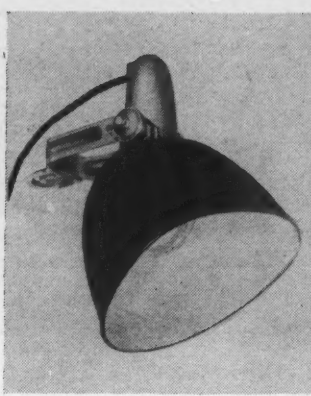
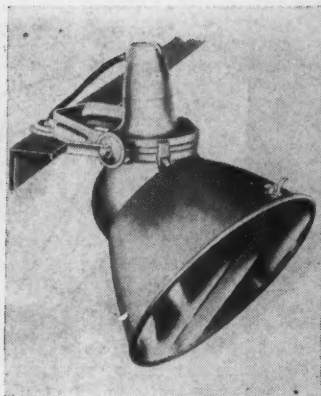


Photo B—Typical floodlighting units: (l. to r.) Type A enclosed unit with lamp horizontal; Type A enclosed unit with lamp vertical; Type B open unit; and Type C water-tight unit with spreadlight lens for swimming pools.

TABLE I

FLOODLIGHTS FOR SPORTS AND RECREATION LIGHTING			
Type	Description	Beam Spread*	Type Lamp**
Enclosed	A-1	Narrow	a-b-c
	A-2	Medium	a-b-c-e-f-g
	A-3	Wide	a-b-c-e-f-g
Open	B-1	Medium	e-f-g
	B-2	Wide	e-f-g
Swimming Pool	C-1	Medium	a-b-c-d
	C-2	Rectangular	a-b-c-d

*Beam spreads arbitrarily defined as follows: narrow—0-10 degrees; medium—10-35 degree wide—35-90 degrees.
**See Table II for "type" designations.

TABLE II

LAMPS FOR FLOODLIGHT PROJECTORS	
a.	250 watt (also 400 watt) G-30 flood light
b.	500 watt G-40 floodlight
c.	1000 watt G-40 floodlight
d.	1500 watt G-48 floodlight
e.	200 watt PS-30 general service
f.	500 watt PS-40 (also 300 watt PS-35) general service
g.	1000 watt (also 750 and 1500 watt) PS-52 general service*

*Hard glass lamps are recommended for use with all open type floodlights

Early installations used the types of floodlights then available, since these units were weatherproof. As night lighting became more popular, the floodlight manufacturers began to study sports lighting requirements and to design new units to meet these requirements.

Basically, sports floodlights are of two types, open and enclosed. Open units consist essentially of a reflector, socket and socket housing, and mounting base or bracket. Reflectors are made of both specular and diffuse aluminum and of porcelain enameled and baked enamel steel. Beam spread is controlled by reflector shape and type of reflecting surface. Light distribution is usually symmetric and of medium or wide angle beam spread. Asymmetric light distribution is also provided with elliptical angle reflectors, or with prismatic glass door lenses. All types are made in several sizes for a range of lamp sizes.

Enclosed type floodlights provide

three types of light distribution, narrow, medium and wide beam spreads. Basic construction includes an outer housing, and inner reflector, a door or cover glass lens, hinged cover, socket housing and socket, and mounting base or brackets. Outer housings are made of cast aluminum, sheet steel or sheet aluminum, and sheet copper. Inner reflectors are made of silver-mirrored glass, specular and diffuse aluminum, and porcelain enameled steel. Door or cover glasses are made in clear, stippled, sanded and spreadlight (prismatic) types. Socket housings are designed for use with concentrated-filament floodlight lamps and for general service type standard lamps. Three basic sizes comprise the general utility floodlight series; 200-250-400 watt size, 300-500 watt size, and 750-1000-1500 watt size.

In an endeavor to produce a less expensive type of enclosed floodlight, manufacturers have designed units with the reflector forming the outer

housing. Sheet aluminum is usually used for the housing on these units, and the housing contour of necessity conforms to the reflector contour used.

Complete details of construction and beam spread characteristics on the various types and sizes of units can be obtained from manufacturers of floodlights. Catalog information also includes description of types of mounting available.

Swimming pool underwater floodlights are similar in design to enclosed type units, except that housings are heavier and the units are gasketed to make them watertight. Housings are made of heavy cast bronze or other metal which will resist corrosive effect of water and chemicals used for water purification.

Concentrated filament lamps are used for accurate beam control, especially in narrow beam type units and in swimming pool underwater floodlights. General service standard lamps are recommended for open type floodlights



Photo C—Tom Jones Softball Park, Dallas, Texas, is lighted with 16-1500 watt Benjamin open type floodlights (Type B-2-g), to provide approximately Class C lighting.

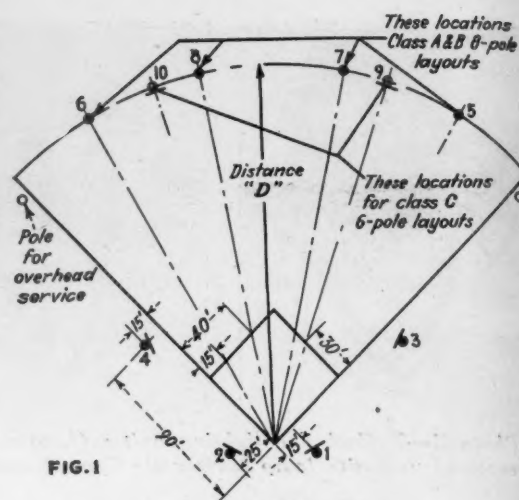


FIG. 1

Recommended Pole Locations
Class "A" "B" & "C" Lighting
SOFTBALL FIELD

and for medium or wide angle enclosed units. Hard glass bulb lamps are also recommended in open type floodlights when 1000 or 1500 watt size lamps are used.

Floodlights are classified as to type, beam characteristics and lamp types and sizes in Table I. Thus the three-symbol description of floodlights on the drawings adequately identifies floodlights for purposes of layouts. For example, the symbol "A-2-g" identifies an enclosed type floodlight having a medium spread beam and using a 1000 watt PS-52 general service lamp. Manufacturers' catalogs should be consulted for units meeting these general requirements, and for additional details on housings, types of mounting, reflecting surfaces, costs, etc.

Layouts are shown for several different sports and types of games. The floodlighting for these games will no doubt form the major market for floodlighting during the 1948 season, except for major sports.

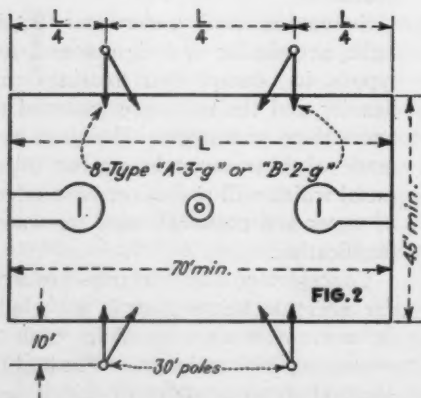
Softball — Recommendations for softball fields are given in Fig. 1.

[Continued on page 196]

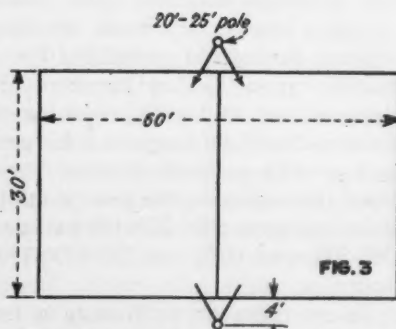
TABLE III

FLOODLIGHTING LAYOUTS FOR SOFTBALL FIELDS						
Type Lighting	"D" (Feet)	Number of Poles	Floodlights* per pole			Total Floodlights*
			Pole locations			
			1, 2	3, 4	5, 6, 7, 8	
Class A	Up to 200	8	2	4	3	24
	200-240	8	3	5	5	36
	240-280	8	4	8	6	48
Class B	Up to 200	8	2	3	2	18
	200-240	8	2	4	3	24
	240-280	8	3	6	4	34
					9, 10	
Class C	Up to 150	6	2	2	2	12
	150-200	6	2	2	3	14

*1500 watt enclosed (Type A-3-g) or open (Type B-2-g) floodlights are recommended. Floodlights should be mounted 40 feet high on pole locations 1, 2, 3 and 4 in Class A, Class B and Class C lighting; 40 feet high on pole locations 9 and 10 in Class C lighting; and 60 feet high on pole locations 5, 6, 7 and 8 in Class A and Class B lighting

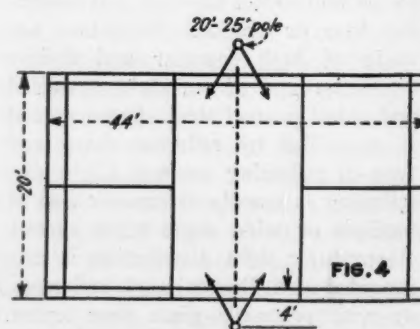


BASKETBALL COURT



Four Floodlights Type "A-3-f" or "B-2-f"

VOLLEY BALL COURT



Four Floodlights Type "A-3-f" or "B-2-f"

BADMINTON COURT

Practical Methods

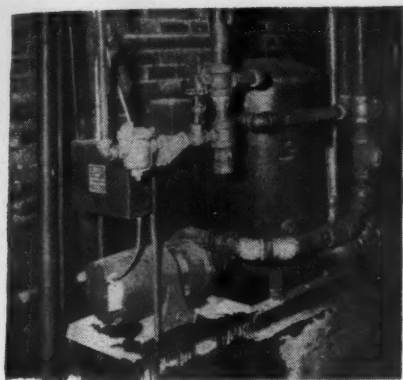


FIG. 1—Small motor is direct-connected to pump which pumps preheated water to boiler. Condensate enters equalizing chamber from receiver above, and is pumped to boiler at high temperature.

Pressure Equalizing Boiler Feed System

INDUSTRIAL

Reduced power costs and low cost handling of return condensate at high temperatures are effected by the High Point Bending & Chair Company, in their furniture plant at Siler City, N. C. These savings are made through the use of a pressure equalizing boiler feed pump system. Tied in with this system is an automatic control system for maintaining the boiler water level, and condensate receiver tank, in which the cold make-up water is preheated before being pumped into the boiler.

In this system, a small $1\frac{1}{2}$ -hp. 1750 rpm. motor pump does the work normally done by a large high-maintenance steam pump, or high-speed, high-pressure centrifugal pump of other systems. This small motor is possible since boiler pressure is automatically admitted to an equalizing chamber, making the pressure in the chamber, in the boiler, and on the pump inlet the same. As a result, the pump-unit does not have to pump against the boiler pressure, but is merely required to lift the water against pipe friction and the low static head of water. Power costs for pumping are thereby reduced to a minimum, in many cases as low as ten

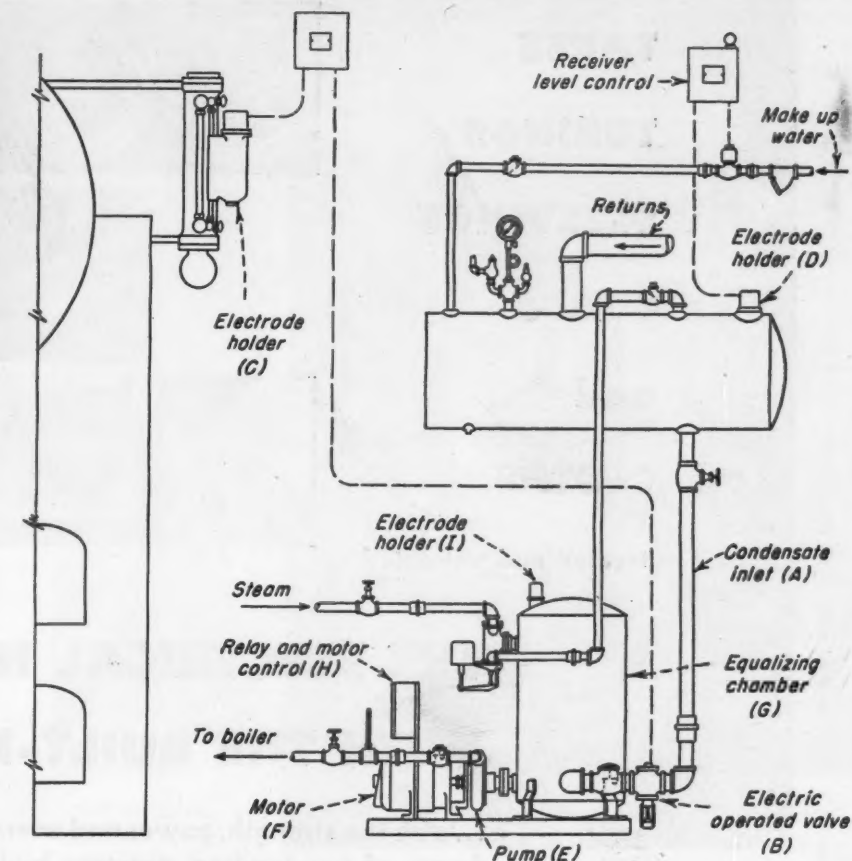


FIG. 2—Diagram showing pressure equalizing boiler feed system with pump-control method of water level regulation.

percent of the costs for other methods.

Keeping boiler pressure on the inlet of the pump during the pumping period, as is done in this system, makes it possible to hold the temperature of the condensate at the highest possible level, some 80 to 120 degrees higher than it can be handled by a piston or high-pressure centrifugal pump. As a result, the heat is largely retained, thus increasing the thermal efficiency and cutting fuel costs. This saving is even more important than the power cost savings effected through the use of a smaller pump.

Operation of the pressure equalizing boiler feed system is simple. It is shown in outline in Fig. 2. By means of a short (high water level) and long (low water level) electrode in the electrode holder (C), installed alongside the glass water level gauge, an electric operated valve (B) in the

intake line from the receiver to the equalizing chamber of the pump is controlled so that condensate is admitted to the chamber. The pump then feeds water to the boiler. It pumps only when the water level reaches the low point, and stops feeding when the water level reaches the high point in the boiler.

Condensate from the receiver is fed to the equalizing chamber as explained above, through the electric operated valve (B). Inside the equalizing chamber are two electrodes, one short and one long. When the condensate level rises to the short electrode, a circuit is completed through a coil in the relay (H). The relay then starts the motor-pump unit which pumps the contents of the equalizing chamber, at high temperature, into the boiler. During this cycle, boiler pressure is automatically admitted to the equalizing chamber so that the

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TAPES

TUBINGS

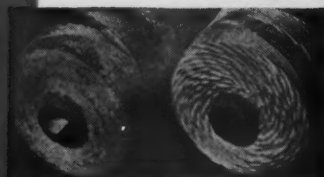
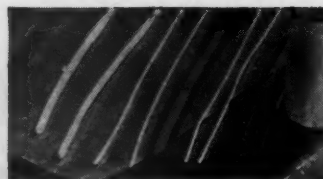
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CORDS

and

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treated and untreated



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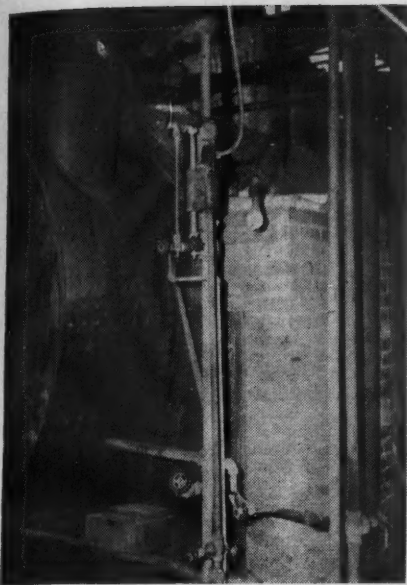


FIG. 1—Electrode holder is installed alongside water level gauge on boiler. When water level drops, an electrical circuit controls relay which opens solenoid valve in condensate inlet, fills equalizing chamber with high temperature water and starts motor-pump.

inlet of the pump is under boiler pressure also, and it is merely necessary for the pump to overcome pipe friction and the static head as represented by the height of the boiler water level.

When the condensate level in the equalizing chamber drops below the end of the long electrode, the electrical circuit is broken to the holding coil of the relay. This stops the pump and causes the steam inlet to be closed, bypassing steam and boiler pressure to the receiver, at the same time releasing boiler pressure from the chamber. If the boiler water level has not reached the short electrode in the electrode holder (C), indicating high water level in the boiler, the above cycle is repeated until the boiler water level rises to the electrode, which automatically stops the pump. When this occurs, the receiver is again ready to receive steam from the boiler and the system is ready to repeat the cycle of filling, equalizing, pumping and opening the steam valve to the receiver when the pump motor stops.

The water level in the receiver is automatically maintained above a minimum level by means of electrodes installed in the receiver, which control an electric operated valve in the make-up water line.

This equalizing chamber, feed-pump, electrodes and holders, relays and controls for the entire system were made and furnished by The Johnson Corporation, Three Rivers, Michigan. Sam Pike, chief electrician, made the electrical installation and is responsible for maintenance.

Flush Cabinet Panel Opens to Form Desk

OFFICE

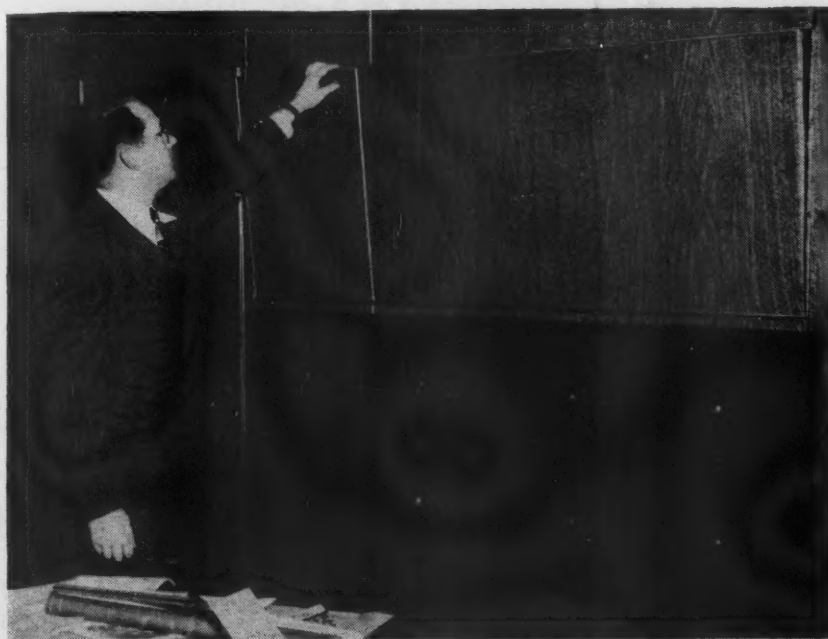
E. G. Potter, vice-president and general manager of the Lima Armature Works, Inc., motor service shop in Lima, Ohio receives his visitors in an imposing wood paneled private office. Its simplicity and the flush arrangement of file cabinets on one wall is impressive.

Should the visit concern technical discussions of motors or drives, or perhaps an estimate involving research

into catalogs or books, Mr. Potter casually leaves his desk, walks to the wall and lowers a hinged panel which conceals his catalog file. At a predetermined angle, the panel stops and forms a slanting desk or work surface 64½ inches long and 24½ inches wide. Counterweighted chain supports operating on pulleys at each end of the concealed bookcase provide this innovation.



E. G. Potter works at wall desk and catalog file in his office. Note recess in top shelf for flexible arm fluorescent fixture.




Work area disappears when Mr. Potter raises hinged panel which conceals bookcase and forms part of wall. Note flush arrangement of file drawers below.

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The built-in bookcase consists of two shelves. The lower one is tall enough to accommodate standard equipment catalogs and is divided into nine sections. The top shelf, for smaller books, has seven divisions. The large center section, equipped with a duplex convenience outlet, provides a recess for a flexible, double-arm, two-lamp (20-watt tubes) fluorescent fixture. This unit can be positioned at any angle over the work surfaces.

When finished, Mr. Potter pushes the lamp back into the recess, raises the desk panel and all is again concealed. The room once more is transformed into an executive-type office.

Cost of DC-AC System Conversion

ESTIMATING

Since the end of hostilities, utilities throughout the country have renewed their efforts to convert old direct current areas to alternating current networks. In fact, the tempo is greater than in prewar years. Commonwealth Edison Company alone asserts its Chicago reconversion project will be a 15 year program.

From the building owners standpoint the big question is: How much will it cost to convert my electrical system? This is a difficult question to answer per se. Too many factors enter into the cost equation. Among these are: Type of building, type of business operation, equipment already installed and the amount of electrical rehabilitation planned when the changeover is made.

Some inkling as to the cost of converting commercial (office) buildings was given in a recent address before a joint meeting of Chicago sections of the Western Society of Engineers, Illuminating Engineering Society, American Institute of Architects and American Institute of Electrical Engineers. The speaker was Ralph H. Decker, consulting electrical engineer of Chicago, who has designed and supervised several large conversion projects in Chicago's Loop area. Accurate cost studies were made of each project. The following figures were presented as a matter of common interest and to indicate present-day trends.

One major project described was a modern 30-story Loop office building having 452,226 square feet of rentable area. Original estimated cost of converting service and distribution of the entire building for an ultimate 60 foot-candle lighting intensity and installation of 30 footcandles (maintained) of

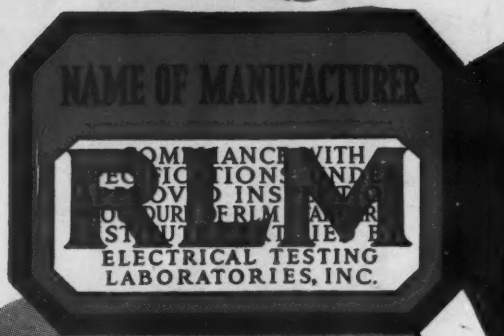
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					CLOSED END			OPEN END		
Spec. No. 1 Bowl	Spec. No. 2 Deep Bowl	Spec. No. 3 Symmetrical Angle	Spec. No. 10 Glosscoat Diffuser		Spec. No. 5 2-40 W Lamps	Spec. No. 6 3-40 W Lamps	Spec. No. 7 2-100 W Lamps	Spec. No. 8 2-40 W Lamps	Spec. No. 10 3-40 W Lamps	Spec. No. 11 2-100 W Lamps
X				Appleton Electric Company						
X	X	X	X	Benjamin Electric Mfg. Co.	X	X	X	X	X	X
X				Bright Light Reflector Co.				X	X	X
				Day-Brite Lighting, Inc.				X		
X				Jones Metal Products Co. (Abelite)						
X				The Miller Company	X	X	X	X	X	X
				Mitchell Manufacturing Co.						
X				Overbaugh & Ayres Mfg. Co.						
X	X	X		Quadrangle Mfg. Company						
X	X	X	X	Smoot-Helman Company				X	X	
				Sylvania Elec. Products, Inc.						X
X	X	X	X	Westinghouse Electric Corp.	X	X		X	X	
X	X	X	X	Wheeler Reflector Company	X	X	X		X	X

*Based upon Report for the Fourth Quarter of 1947 by Electrical Testing Laboratories, Inc., the independent testing agency of the Institute.

** Spec. #22 covers a new 2-40 W fluorescent longitudinal shield unit.

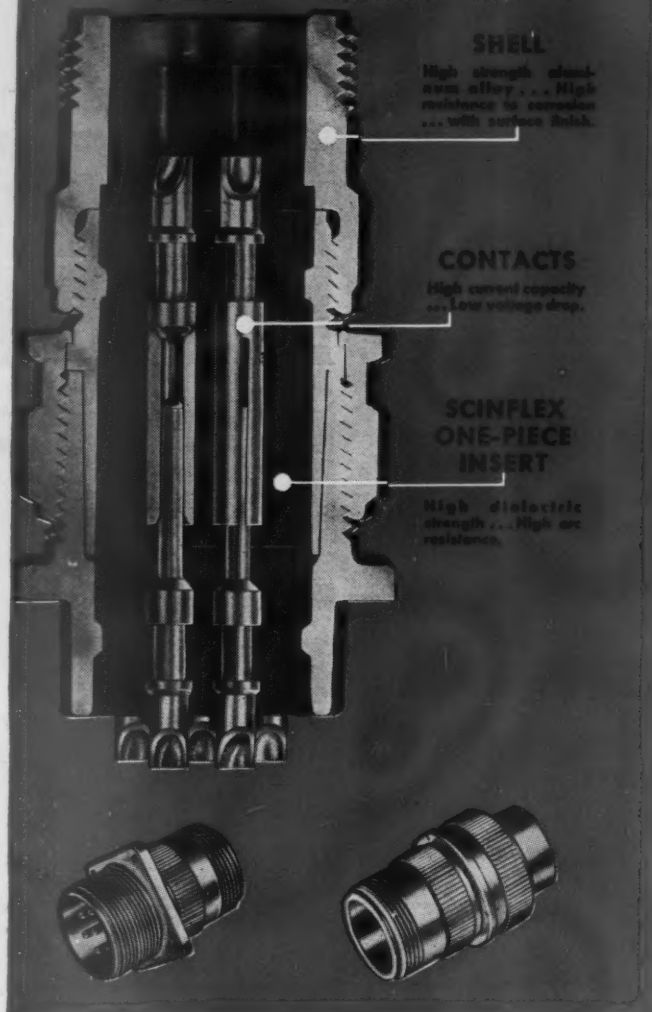
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* Electrical Testing Laboratories, Inc., 2 East End Ave., New York 21, N. Y.—an independent testing organization, serving American industry for 50 years and responsible for the inspection and certification of lighting units to RLM Specifications. Fourth Quarter Report above shows manufacturers who can supply lighting units made in accordance with RLM Specifications as indicated by (X).



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lighting on 10 floors was \$550,000. For 45 footcandles (ultimate), the cost was estimated as 87 percent of the above; 30 footcandles, 73 percent; 15 footcandles, 58 percent. Management chose the 60 footcandle distribution system with 30 footcandles installed on 10 floors. A \$692,000 total completed project cost reflected equipment, labor and material price increases during the construction duration.

A percentage breakdown of the cost of various categories of conversion work, typical of most office buildings, was approximately as follows:

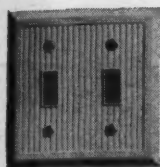
Work Category	Percent of Completed Cost
Building motors	6.0
Power circuit wiring	1.0
Distribution (service, switchboards, feeders, etc.)	31.2
Removal of d-c equipment, existing lighting fixtures, temporary wiring	4.2
Corridors and public space	0.8
Building utility areas	0.4
Underfloor duct installation on ten floors	27.2
Fluorescent lighting on ten floors for 30 footcandle (depreciated) intensity	20.5
Provision in distribution for air conditioning	8.7

Design calculations for the feeder system were based on a minimum value of five watts per square foot for lighting and convenience outlets, plus $1\frac{1}{2}$ watts per square foot for air conditioning. Maximum permissible voltage drop was three percent. The complete feeder system with phase balancing panels at each floor, placed special emphasis upon diversity which would vary with the type of tenant and his specific requirements.

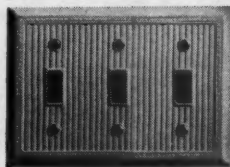
Because of existing structural conditions, conduit and cable feeders were most advantageous. Three 500 MCM phase cables with one 350 MCM neutral cable in a $3\frac{1}{2}$ -inch conduit created the ideal system and was used throughout for lighting feeders. To handle diversity between different floors (it rarely exists on individual floors in office buildings), a system of parallel feeders serving a considerable area (say three or four floors) was installed. This permitted greater flexibility than single risers serving a smaller area of one or two floors; permitted the use of smaller feeders and circuit breakers.

Cost of lighting ten floors (average of 17,000 square feet each) was \$46.30 per luminaire. Fixtures were mounted on 8-ft. centers with ten units per circuit. Above cost included fixture (\$23.19), lamps, wire-mold, wiring of fixtures, branch circuit wiring installed in existing home run conduits, installation of new wall switches, plates,

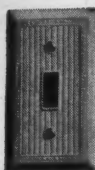
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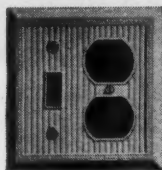
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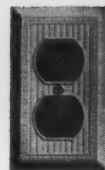
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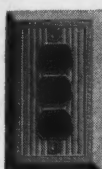
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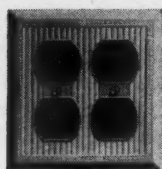
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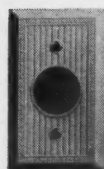
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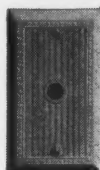
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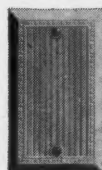
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116-AP



wiring for local control and all labor. Cost of installing 1,250 lineal feet of underfloor triple-duct on a hardwood floor laid on sleepers with a concrete and cinder fill was \$5.44 per lineal foot. Cutting through wood floor was accomplished with a Skillsaw using a toothed wheel; through sleepers and fill with a carborundum wheel.

Cost of installing 2,800 lineal feet of flush-type triple duct, with *after-set* inserts, on a concrete floor was \$6.43 per lineal foot. Floor cutting was done with air hammers. To cover the 17,000 square feet of floor area, longitudinal runs of 170 feet were installed on 9-foot centers and connected laterally by means of junction boxes on 17-foot centers.

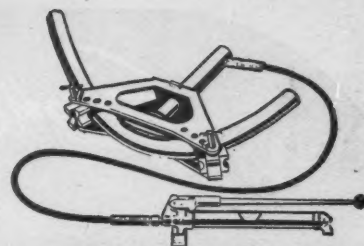
Electrical Service for Ship Repairs

MARINE REPAIR

To handle more tonnage and complete marine repair jobs quicker, the Todd Shipyard Corporation has just completed the construction of a new, fireproof, 685-foot, steel and concrete pier for their Hoboken, New Jersey, yard. Mounted on the pier is a 25-ton Gantry crane with a horizontal swing of 70 feet either way and a vertical lift sufficient to lift objects over the top of the pier or over ships lying alongside.

Twelve service stations supply electric power, the primary characteristics being 440 volt, 60 cycle, 3 phase. Portable 25 kva. transformers step current to 120/208 volts where required for lighting and other low voltage equipment. Outlets also furnish d-c at 125/250 volts. Operating from the electrical system is a public address system, an automatic fire alarm system and 100 welding machines. All electrical cables are Simplex Anhydrex Neoprene, selected for salt water resistance. The electrical contractor was the J. Livingston Company.

Fourteen mechanical service stations furnish fresh water, steam, salt water, compressed air, oxygen and acetylene gas. Each utility is supplied through a differently-painted outlet to avoid error. Colors used are yellow, black, white, blue, green and red. The six sets of pipe complete a loop around the entire pier for a total distance of 8580 feet. Mechanical work was completed by Eugene Duklauer, Inc. An interesting feature is the lack of expansion joints along the 685-foot deck. At the inshore end, to provide for seasonal contraction and expansion, a 3-inch joint is provided.



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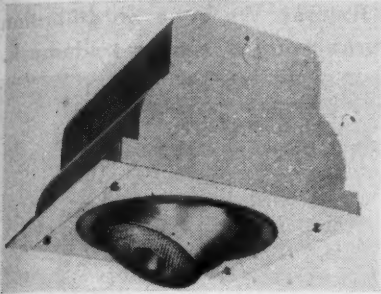
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Equipment News



Spotlights

A new incandescent spotlight for use with recessed fluorescent troffers has been developed. Known as Trofferspot, it has been designed to provide a concentration of light for dramatic spot illumination of merchandising displays. It can be installed as an individual unit or between troffers in a continuous run. It can also be used at the end of a row of fixtures or at the corner of rectangular installations. The downward beam of light can be adjusted to swing in a complete circle and can be angled up to 23 degrees from its vertical axis. Type PAR 38/50-watt incandescent lamp with a built-in reflector is used. A similar incandescent spotlight has been developed as an addition to the "Officer" line of fluorescent lighting fixtures. Leader Electric Company, 3500 N. Kedzie, Chicago, Ill.



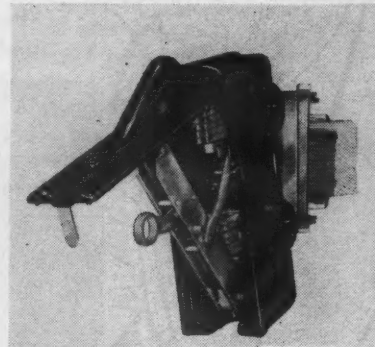
Fixture Stud

A new heavy-duty fixture stud for S-type bar hangers which permits outlet boxes to be easily attached has been announced. Once the stud has been slipped into the center hold of the box and tightened by a single screw, the outlet box is held firmly in place. S-type bar hangers come in two sizes, one for spacings between studs or joists up to 16 inches, and the other for spacings up to 24 inches.

Either will fit in a space as narrow as six inches. Because the hangers fit between the framing instead of being nailed to the face of the stud, plaster cracks or bulges on the finished walls are eliminated. General Electric Company, Bridgeport 2, Conn.

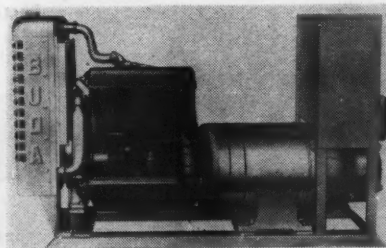
Wall Outlet

This two-way electrical outlet made of plastic is designed primarily for use in the home to prevent children from placing metal and other foreign objects into wall outlets. Receptacle is a rotary dial cap that covers the wire terminals. This plug, known as No-Shok, requires a quarter turn of the dial cap, which has two contact slots, before the cord plug comes into contact with the terminals, then is pushed in to complete the circuit. To break the circuit, the plug is pulled out as in conventional receptacles, and the self-closing dial cap automatically snaps back. Heavy duty terminals are insulated and metal parts are rust-proofed. Bell Electric Company, Chicago, Ill.



Disconnect Switch

A new design of the porcelain-enclosed disconnect switch designated as ES, for application on distribution systems up to 7500 volts, and having current ratings of 200 to 600 amperes has been announced. Such a switch, in practice, may have to stand being left in the open or closed positions for very long periods of time, with the contacts exposed to the corrosive influences of various atmospheric conditions. This switch is designed and constructed to cope with these conditions, and to provide dependable service with a minimum of maintenance. S&C Electric Company, 4433 Ravenswood Ave., Chicago 40, Ill.



Generators

A new line of industrial gasoline engine electric generator sets are available in d-c or a-c, single or three phase and in sizes from 10 kw. to 125 kw. Each set is complete and equipped with controls, generator, radiator, and engine mounted on a self-contained base. Gasoline engine is water cooled. A circulating pressure system of lubrication is provided to crankshaft bearings, camshaft bearings, rocker arm bearings, and rocker arm shaft. Equipment includes electric starter, lubricating filter and air cleaner. They are designed for both standby and standard service. For standby service, the engine speed is moved up so that greater kw. capacity may be obtained on the same set. When used for continuous or standard service, the engine speed is set so it will have a long continuous life. Buda Company, Harvey, Ill.

Transformer

A new 200 ma. transformer specifically engineered for fluorescent lamps of long, slim design has been announced. It incorporates the constant voltage principle which permits the maintenance of rated wattage and lumen output. In operation, the transformer efficiency is high with overall lumen output of approximately 55 lumens per watt maintained at maximum and minimum primary voltage values. Sola Electric Company, 4633 West 16th Street, Chicago 50, Ill.

Connector

A new connector, No. 19-PC, to be used with No. 15-P and No. 15-PC attachment plugs has been developed. It is a heavy duty, unbreakable, all rubber, oil resistant connector. The rubber jacket has a flexible shank. The cord grip clamp removes tension from the connections and allows one to yank the connector loose, without danger of shorts and breakages. It is rated 10 amp., 250 volt, and 15 amp. 125 volt. Ericson Manufacturing Company, 5209 Euclid Ave., Cleveland 3, Ohio.



THE *New* ACHIEVEMENT BY ALL-BRIGHT, CHICAGO

There is only one manufacturer of All-Bright fixtures. We have no affiliation with any other manufacturer of lighting fixtures using a similar trademark.

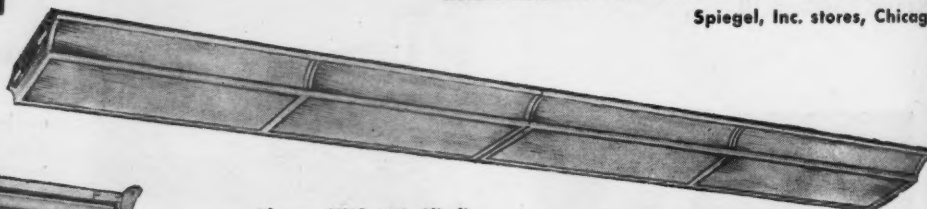
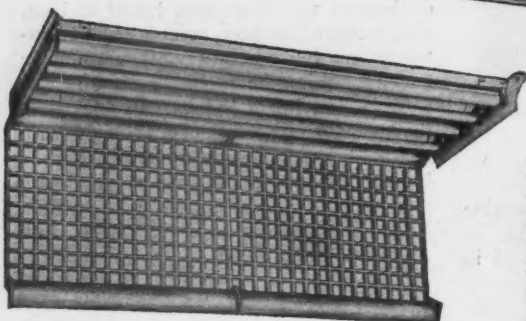


THE *Executive* *Luminaires*

Designed for Beauty,
Efficiency and Performance

Recent Installation of Executive Luminaires in one of the
Spiegel, Inc. stores, Chicago.

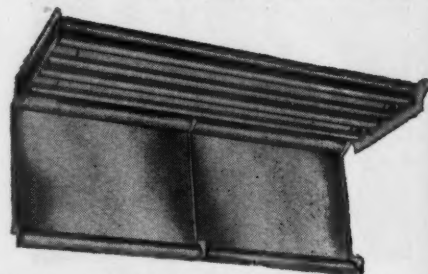
Below: XUL-440, Louvered



Above: XUG-496, Slimline

Below: XUG-440, Fluorescent

Designed for modernization plus eye-appeal, these extremely shallow units have an overall depth of from 3½ in. to 5 in. Convex glass ceramic finish side panels streamline these fixtures and provide wide illumination distribution.



Fluorescent Fixture Data							
Lamps				Approx. Dimensions			
Cat. No.	No.	Watt	Line Volts	Length	Width	Height	
XUG-240	2	40	118	48½	14	3½	
XUG-440	4	40	118	48½	21	3½	
XUL-240	2	40	118	48½	14	4½	
XUL-440	4	40	118	48½	21	4½	

Slimline Fixture Data							
Cat. No.	No.	Watt	Line Volts	Length	Width	Height	
XUG-296	2	51	118	96½	14	4½	
XUG-496	4	51	118	96½	21	4½	
XUL-296	2	51	118	96½	14	5	
XUL-496	4	51	118	96½	21	5	

Ease of Maintenance... Removable or hinged cradle contains side panels and louvre or bottom glass. Easy accessibility to component parts or wiring by two slide catches which lower reflector. **Construction...** Heavy gauge metal reinforced K.O.'s provided. **Finish...** Durable baked white enamel, reflection factor 87%. **Wiring...** Wired complete, 110-120 volts, 60 cycle A.C. **Certified...** Approved by Underwriters' Laboratories, Inc., Wiring and Fabricated, A. F. of L.

Contact your electrical wholesaler for immediate delivery. Write for complete 24 page illustrated catalog.

Trademark Registered.

ALL-BRIGHT ELECTRIC PRODUCTS COMPANY

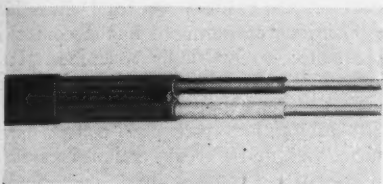
Manufacturers
of Fluorescent
Lighting Fixtures



3917-25 N. Kedzie Ave., Chicago 18, Illinois

Lighting Transformer

A new line of dry-type transformers equipped with built-in primary circuit breakers and thermal protection against overloads for supplying industrial lighting and small-power circuits from industrial power circuits has been announced. They can be connected directly to open or conduit wiring. Circuit breaker handle projects through the front of the transformer case. The thermal trip elements on the circuit breaker prevent damage to the transformer from short circuits or from excessive overloads but permit nondamaging short-time overloads to be carried safely. Ratings are available from 3 through 50 kva. for 240 to 120-240 volts, 480 to 120-240 volts, or 600 to 120-240 volts single phase, 60 cycles. Westinghouse Electric Corp., Pittsburgh 30, Pa.

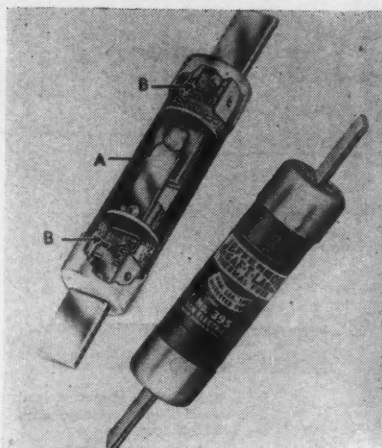


Cable

A non-metallic sheathed cable, known as RoFlex, has been added to this line of wires and cables. Individual conductors, insulated with Synthanol thermoplastic compounds, are permanently colored for circuit identification, and are resistant to oils, acids, alkalis, moisture, and flame. Over each insulated conductor is a spiral wrap of specially treated paper to provide protection against mechanical injury. Impregnated jute fillers in each valley add longitudinal strength to cable and serve as "rip cords" for stripping the outer braid of flame and moisture resistant cotton. It carries Underwriters approval for 60° C operation. Rome Cable Corporation, Rome, N. Y.

Induction Motors

This line of 2-pole, totally inclosed, fan cooled, squirrel-cage motors from 250 to 500 hp. has been redesigned. They are normal starting torque, low starting current type, suitable for full voltage starting. Motors are rated 55 C rise continuous, and available for 3 or 2 phase, 60 cycle, 440, 550, or 2300 volt operation. They are especially designed for direct drive of high speed blowers, pumps, compressors and other similar equipment in locations involving excessive moisture conditions or dust of an abrasive or conducting nature. Windings are completely enclosed, and bearing brackets and external fans are enclosed within an outer end shield. Double-end ventilation is used. Split bearing brackets and split sleeve bearings are used. Burke Electric Company, Erie, Pa.



Thermal Fuses

New triple-duty Saf-T-Lag thermal fuses have been announced. They feature the long time-lag that eliminates blowing and delays when harmless overloads or starting in-rushes occur. Internal temperatures are relatively cool because thermal connection breaks the circuit when a temperature of 280° F. is reached. Both ends of current-carrying copper fuse strips (B) are alike. The trigger spring (A) which also carries the current, is a copper alloy. It has low resistance. Jefferson Electric Company, Bellwood, Ill.



Mercury Switch

A new silent mercury switch with a 10 ampere T-rating at 125 volts has been announced. It replaces the 5 ampere switch. It is claimed that the doubling of the interrupting capacity in the new switch opens wide new fields for its use. Switch has been equipped with a new handle available in either ivory or brown plastic. Mercury is contained in a metal enclosure, which consists of mercury-to-mercury contacts enclosed in two special metal alloy disks that are glass-sealed on a ceramic barrier. Hydrogen gas in the "button" prevents oxidation. General Electric Company, Bridgeport, Conn.

Fluorescent Troffer Unit

A new series of fluorescent troffer units known as "Togl-trof" has been announced. The unit is self fastening, self-contained and adaptable to every type of ceiling in which you can build a raceway. The principle is the toggle like clamps at the sides of the troffer, which grip the upper surface of the ceiling and automatically suspend the fixture, without the use of hangers, clamps, flanges, pipes, chains or hooks. They are available in two, three or four lamp units, in open type fixture, linex glass bottom, lens type bottom or baffle type louvres. Mobilite, Inc., 440 Mercer St., Jersey City, N. J.

Pull Canopy Switch

A new super-thin six ampere pull canopy switch has been announced. Of rotary design, the switch is 7/16 in. thick and 1 1/2 in. in diameter. It is constructed of black bakelite and is shock-proof. The phosphor bronze contact points are .014 in. thick. The chain is arranged for direct, centrifugal pull through an insulated channel in switch case. It is furnished with 6 in. No. 18 stranded leads, brass finial, steel locknut, brass beaded chain and pull string. Switch has been approved by Underwriters Laboratories. The Serv-All Manufacturing Company, 334 N. Bell Avenue, Chicago 12, Ill.

Industrial Motor

A single-phase Life-Line capacitor-start, induction-run, squirrel cage motor is available in ratings of 1/2, 1, 1 1/2, 2, 3, 5 and 7 1/2 hp. This motor, Type CAP, is of all-steel construction. It utilizes the capacitor for starting only. The starting switch or relay disconnects the capacitor as the motor approaches full speed and then operates as induction run motor. Air openings are in lower half of the end brackets. Motors are available for 60, 50 and 25 cycle, single-phase, 110/220 volts dual voltage, 110 or 200 volts single voltage; Westinghouse Electric Corp., Pittsburgh 30, Pa.

Transfer Switch

Narrow vertical tandem transfer switches for control centers and circuit breaker switchboards have been added to this line. Instead of being mounted right and left, the normal and emergency source poles are mounted one above the other. Ratings available are 75 to 1000 amperes, all forms, both a-c and d-c. For built-in applications, switches are furnished for front-connected services at top and bottom and with back-connected terminals for load circuits at center. They can also be furnished with all terminals back-connected. Automatic Switch Company, 391 Lakeside Avenue, Orange, N. J.

POWDER OPERATED CONSTRUCTION TOOL

Drives Threaded Studs 3 Inches
into Concrete INSTANTLY!



"You won't believe it until you see it operate," is the almost unanimous opinion of contractors who have adopted the amazing new Powder-Power tool, DRIVE-IT, to drive steel studs through wood or metal into concrete.

HOW IT WORKS

The DRIVE-IT tool employs a small powder charge encased in a standard cartridge to drive studs 3" into concrete and through 5/8" steel. The desired stud and cartridge are placed in the tool. The muzzle of the tool is placed on the spot where the stud is to be driven and the tool is forced forward. This detonates the explosive charge, driving the stud into concrete or steel with such force the stud actually fuses with aggregate or metal. Up to 6000 lbs. force is required to pull DRIVE-IT studs from ordinary concrete.

UNLIMITED APPLICATION

The DRIVE-IT tool offers unlimited application for all contractors:

ELECTRICAL: For anchoring conduits, switch boxes, cables, etc., to concrete and masonry.

PLUMBING AND HEATING: For hanging pipe, heating ducts, from concrete ceilings or walls.

PLASTERING: For suspending ceilings or "nailing" wood furring to concrete.

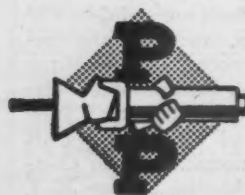
GENERAL: "Nailing" steel window and door frames, wood sleepers, etc., to concrete.

ABSOLUTELY SAFE

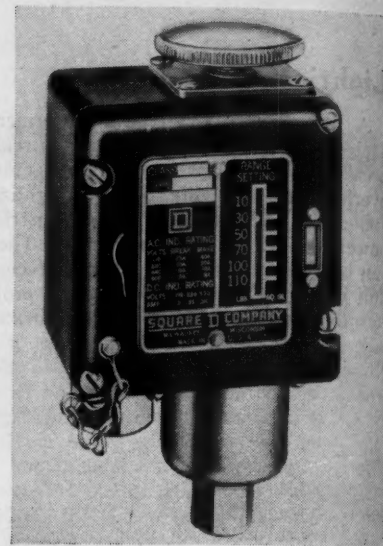
DRIVE-IT, the **original** powder-operated tool, functions without recoil shock. It is **absolutely safe** and cannot be discharged even if dropped several floors.

Write for Demonstration

The DRIVE-IT distributor in your region will be glad to show you the .38 cal. and .22 cal. models in operation. Write for complete DRIVE-IT information, name and address of your nearest distributor.

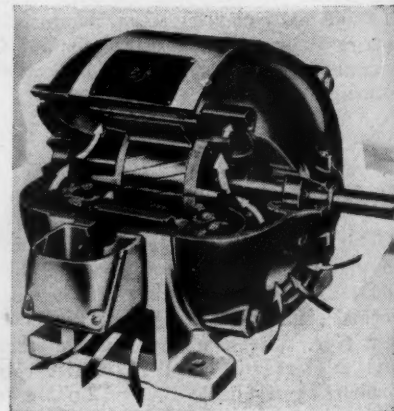


POWDER POWER
TOOL CORPORATION
FOOT OF S.W. WOODS STREET (DEPT. G)
PORTLAND 1, OREGON



Pressure Switch

This new pressure switch is designed to cover the wide range and diversified applications encountered in the control of pneumatic or hydraulic machines. It is for use in the control circuits of welding equipment, machine tools and high pressure lubricating systems. Positive quick-make and quick-break action is assured by use of a precision single-pole, double-throw snap switch mechanism. Separate, non-overlapping normally open and normally closed circuits with double-break silver contacts are provided. A trip indicator operates behind a window in the cover, permitting observation of switch action. Bellows-actuated types are available in a variety of ranges up to 1000 P.S.I. Piston-actuated controls for use in the hydraulic field are suitable for pressures up to 3000 P.S.I. Square D Company, 4041 North Richards Street, Milwaukee 12, Wis.



Electric Motors

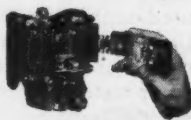
Three new lines of general purpose electric motors have been announced. Called "Permamotors", the new lines include fractional hp. ratings; integral hp., single phase; and integral hp. polyphase motors. Fractional hp. are of the general purpose, capacitor start, single phase type. Available in the 56 and 66 frames, they feature squirrel cage rotors with quiet-operating, positive-acting switches.

C-H 9586

The Standard motor starter that is *Specially Engineered* throughout



Only in C-H STANDARD Control
Special Engineering Features Like These



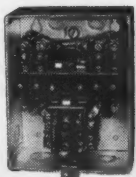
Vertical Dust-Safe Contacts, cool, accessible, safe . . . mean better control.



Heavy pure silver contacts. Lava insulators keep heat from stainless steel contact springs, insuring contact pressure.



Famed "Drop of Solder" overload relay further refined, free-tripping. New heater coil construction.



Densheath internal wiring for fine appearance. Advanced design, modern cover.

Case has solid back. Mechanism rubber mounted.



Starter available with or without push-buttons in case, with transfer switch, in combination starter, as "skeleton."

You get *PLUS* features . . . when you specify Cutler-Hammer *Standard* 9586 Motor Control for your squirrel cage motors.

This is not a starter made up just to sell in a package and at a price. It is a starter embodying what Cutler-Hammer Engineers have learned in more than a half century of solving *all* motor control problems . . . special and standard alike.

No other starter gives you the exact and accurate protection which you find in the 9586 overload relay . . . the famous Eutectic Alloy overload relay that enables you to drive every motor to its safe limit . . . *saving power, saving time, saving money*. No other starter offers the Cutler-Hammer specially designed and processed vacuum-impregnated coil construction that virtually eliminates all coil troubles in small motor control performance.

The same *special engineering* approach is found in the *STANDARD* C-H 9586 contacts, in the arc shields, the contact structure . . . in every other detail. This same *special engineering* quality applied to a *STANDARD* package item is moving more and more shrewd control buyers to *insist* on the 9586 starter and accept no other . . . for maximum life, and dependability, and minimum attention. **CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ont.**



THANK YOU

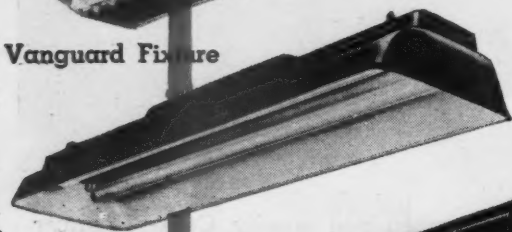
for being discriminating!

When buyers start demanding Quality Lighting Equipment — We're happy!
When they want quality Lighting Equipment at Economy Prices — we bubble over with joy! — Because then our business really booms!

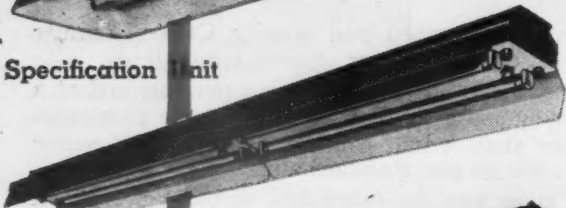
Here is some of the BEST LIGHTING EQUIPMENT money can buy.



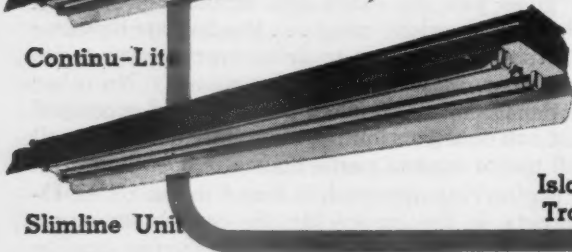
Vanguard Fixture



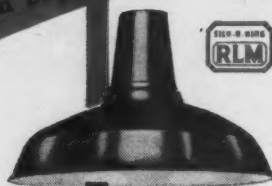
Specification Unit



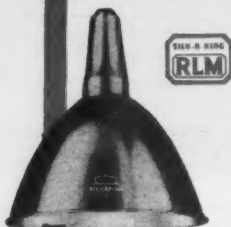
Continu-Lite



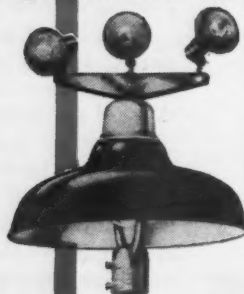
Slimline Unit



Standard Dome Reflector
RLM Specification No. 1



Alzak Aluminum
High Bay Mounting



Island Light with attached
Trough and Flood Lamps

For the complete line of SILV-A-KING Flood-lighting Units, and all other Incandescent Reflectors, send for free Catalog #50.

NEW CATALOG



BRIGHT LIGHT REFLECTOR CO.

INCORPORATED

Subsidiary of BRIDGEPORT PRESSED STEEL CORPORATION

FAIRFIELD & STATE, BRIDGEPORT 5, CONN.

SALES OFFICES:

Atlanta, Ga.
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Los Angeles, Cal.
Minneapolis, Minn.

New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
San Francisco, Cal.
St. Louis, Mo.



Prelubricated, sealed-type ball bearing fractional hp. motors also available. Integral hp. ratings are of the single phase, general purpose, capacitor start type. Available in 1 to 5 hp. in frames 203, 204, 224 and 225. Starting capacitors are in the starting windings. Capacitors are cut out when motor reaches a predetermined speed, by a positive-acting, protected, enclosed voltage relay. Relay is mounted in dust-proof, splash-proof, steel box between feet opposite terminal box. Polyphase, squirrel cage, induction motors are available in frames 203-326, with NEMA mounting dimensions. Motor is protected against dripping moisture and falling objects. Oversize, double-shielded ball bearings are same size and interchangeable, permitting shaft extension from either or both ends of motor as desired. All motors have NEMA mounting dimensions. A. O. Smith Electrical Mfg. Co., Milwaukee, Wis.

New Equipment Briefs

A portable tool kit has been announced by Ingersoll-Rand Company, New York City for use in installation and repair work. It includes the new electric impact tool. . . . General Electric Company, Schenectady, N. Y. has a new portable leak detector especially designed for production testing of hermetically sealed units such as are used in refrigerators, deep freezers, and air conditioners in which halogen compound is the refrigerant.

A low temperature fluorescent lamp, designed to operate in zero weather, has been developed by Duro-Test Corporation, North Bergen, N. J. . . . Chelsea Fan & Blower Co., Inc., Irvington, N. J. has announced a spring mounted, vertical air discharge attic ventilating and comfort cooling fan. It is suitable for residential and commercial use. . . . A new Spiracool backing pad for disc sanders is being produced by the Pratt Manufacturing Company, Inc. of Fairmount, Ind. The pad is made of layers of rubber reinforced with fabric.

The Lamp Department of the General Electric Company, Nela Park, Cleveland, has added two new lamps. They are 60 and 100 watt yellow enameled lamps for outdoor lighting. . . . The new phase sequence indicator developed by Associated Research, Incorporated can be used with 115, 200, and 440 volt circuits. It is for installing and servicing polyphase wattmeters, motors, watt-hour meters, power factor meters, alternators, transformer banks and other equipment.

A 50 percent increase in the rated life of two quartz type mercury vapor lamps for street lighting and general lighting service—the 250 watt C-H5 and the 400 watt E-H1—has been announced by the Westinghouse Lamp Division, Bloomfield, N. J. . . . Electro Mechanical Devices Co. of Detroit has brought out a new 25 hp. transmission and absorption dynamometer, with a speed range of 200 to 6500 r.p.m. It is

IT'S THE **ROTARY IMPACT** THAT DOES IT

**NO KICK
NO TWIST
EVEN ON THE
TOUGHEST JOBS**

AMAZING all-purpose ELECTRIC TOOL will

- Drill up to $\frac{1}{4}$ " dia.
- Ream up to $\frac{1}{2}$ " dia.
- Tap up to $\frac{1}{2}$ " dia.
- Run Nuts up to $\frac{3}{8}$ " dia.
- Drive Screws up to $\frac{3}{8}$ " dia.
- Hole Saw up to $1\frac{1}{2}$ " dia.
- Bore Wood up to $2\frac{1}{2}$ " dia.
- Drive Studs up to $\frac{3}{8}$ " dia.
- Drill Masonry up to $\frac{3}{8}$ " dia.
- Extract Broken Studs up to $\frac{3}{8}$ " dia.
- Wire Brush up to $\frac{3}{8}$ " dia. shanks.

(Uses Standard Attachments)



AMAZING! No Kick—No Twist—Even if you stall the spindle completely, the motor continues to run.

AMAZING! It's Reversible—full power in either direction—runs on 110V ac-dc.

AMAZING! It saves up to 90% of the time on nut-running operations alone.

AMAZING! With Standard Attachments you need only ONE INGERSOLL-RAND IMPACT TOOL to do all operations.

Call your nearest distributor for a demonstration

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156-18



McGILL *Levolier* SWITCHES

TRADE MARK

TRADE MARK



No. 41

ASSURE...

POSITIVE ACTION
FROM ANY ANGLE



No. 201

2 circuit
3 amp.
125 volt



No. 301

3 way pull
3 amp.
125 volt



No. 1020-S

2 circuit
10 amp.
125 volt



No. 265

6 amp., 125 volt
Double pole
Double throw



The patented universal pull lever action of LEVOLIER Switches provides instantaneous control from any angle. Their high quality, watch-like construction guarantees dependability and longer service. Specially designed sizes and types are easily applied to motors, fans, electrical appliances and lighting fixtures.

Model Number 41, shown here, is the most compact 6 amp. switch on the market today — only $\frac{5}{8}$ " thick. Particularly adaptable for a canopy mounting. Qualifying for a "T" Rating by Underwriters' Laboratories, through many years service, it will safely take an initial surge of 48 amps. — eight times its rated capacity.



A complete description of the many types and sizes of LEVOLIER Switches is found in McGILL Catalog No. 43. Send for your free copy today.

ONLY McGILL MAKES *Levolier* SWITCHES

McGILL MANUFACTURING CO., INC.

Electrical Division

450 N. Campbell Street

Valparaiso, Indiana

designed for testing gasoline engines, electric motors, air compressors, fluid motors, fuel pumps, and gear pumps.

Simplified contact renewal is featured in Federal Electric Products Co. Noark motor starters. . . . Allied Control Co., Inc., New York City has announced a single pole Type AS relay for applications of many kinds in all types of controls. . . . General Electric Company, Pittsfield, Mass. has introduced Thermistors, electrical semi-conductors that respond to temperature variations as small as one thousandth of a degree.

Radio Receptor Company, Inc., New York has announced a line of selenium power rectifiers. . . . Two new home ventilating fans, eight and ten inch models are being manufactured by National Appliance Co., Detroit, Mich. . . . Westinghouse Electric Corp., Pittsburgh, Pa. has announced Safe-Temp, an automatic thermal protection control, designed to replace the regular temperature relief valve which releases water from the tank to relieve pressure caused by overheating.

General Electric Company, Schenectady, N. Y. has developed a new relayed automatic recloser designed to provide improved service continuity and reduced operating costs on rural lines. . . . Trico Fuse Mfg. Co., Milwaukee, Wis. has announced a new, visible, unbreakable, automatic oiler. The feed spout is arranged to the side instead of dead center, making it possible to mount the oiler where clearance is limited. . . . The Cleco Division of the Reed Roller Bit Company, Houston, Texas, has announced the Handi-Drill, a rotating pneumatic drill which hits and rotates at the same time. It can be used as a chipping tool, scaling hammer or a light riveter.

Scientiae Corporation, Dayton, Ohio has announced Spiralok, a fixed adjustable variable pitch V-belt pulley. . . . Alnico 2 permanent magnet provides d-c excitation for a self starting synchronous inductor motor made by General Electric Co., Pittsfield, Mass. The Alnico permanent magnet is within the rotor structure. . . . Cummins Business Machines Corporation, Chicago, Ill. has developed a new portable electric $\frac{1}{4}$ inch drill, also rated for 1 inch bits when drilling in wood.

The Globe Tool and Engineering Company, Dayton, Ohio has announced a new service precision dynamic balancer which eliminates vibration. . . . A larger diameter stick of pipe joint compound called Jumbo Pipetite-Stik for larger threaded pipe is available from Lake Chemical Co., Chicago, Ill.

Greenlee Tool Co., Rockford, Ill. has announced a bit set for pipe-size holes. The set is designed specially for use of electricians, plumbers, and steam fitters for boring holes in wood for pipe. . . . General Electric Company, Pittsfield, Mass. has placed on the market four grades of phenolic liquid resin and two grades of phenolic varnishes. . . .

Buckingham Manufacturing Co., Inc., Binghamton, N. Y. has announced a new industrial safety seat.

**Play Safe
Use SECURITY**



**For a Grip
that STICKS**



Pick Security Friction Tape

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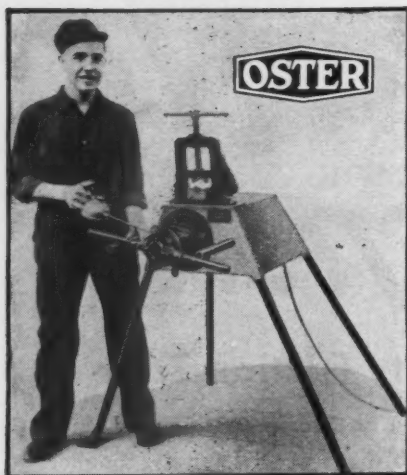
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MAKING WOUND ROTOR BAR CONNECTORS [FROM PAGE 79]

bars from binding. Fig. 5 shows how the assembly, which is machined and filed to a finish, works. Since all parts can be varied to suit individual requirements, detailed dimensions are omitted.

This assembly is then mounted between the flange guides on the base. The hand adjusting screw is attached to the front jaw, vertical adjustment screws to the horizontal jaw, and work guides and stop bar to the top of the vertical jaws.

When the setup for forming the connectors is made, the back jaw is adjusted and tightened in place. The front jaw is adjusted for proper connector width by turning hand screw S (Fig. 3). Depth adjustment is provided by the vertical bolts on the hori-

zontal jaw. Care should be exercised to keep this jaw level so all four bolts will take their share of the load. The work guides and stop bar on top of the vertical jaws are set to accurately position the copper strips.

The forming punch, ground and filed to correct dimensions, is welded to a shaft of $\frac{3}{4}$ -in. cold rolled stock. A set-screw collar fastens the punch-shaft to the piston rod. Since the unit is not adjustable, one must be made for each size connector fabricated. This is a small task and in short time most sizes will be on hand.

After all adjustments have been made, the copper blank is positioned against the stops on the adjustable forming die and the completed connector is formed as shown in Fig. 6

One additional precaution is necessary. If rotor is soldered, copper strips should be tinned. This is not required if phos copper joints are made.

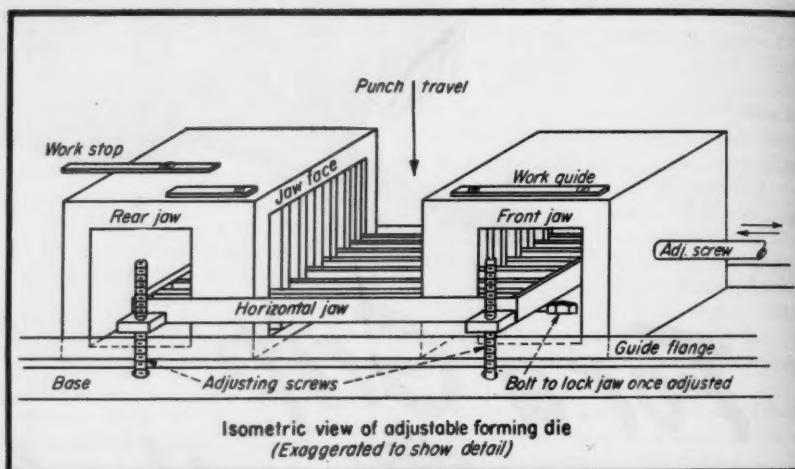


FIG. 5—Isometric view showing how adjustable jaws of forming die assembly intermesh to form die for crimping copper connector.

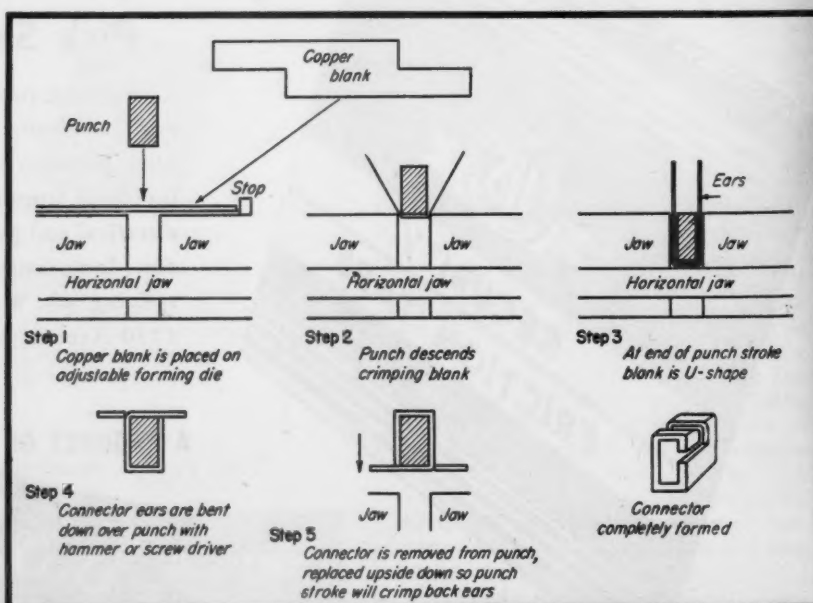


FIG. 6—Details of forming operation steps, from copper blank to completed connector.

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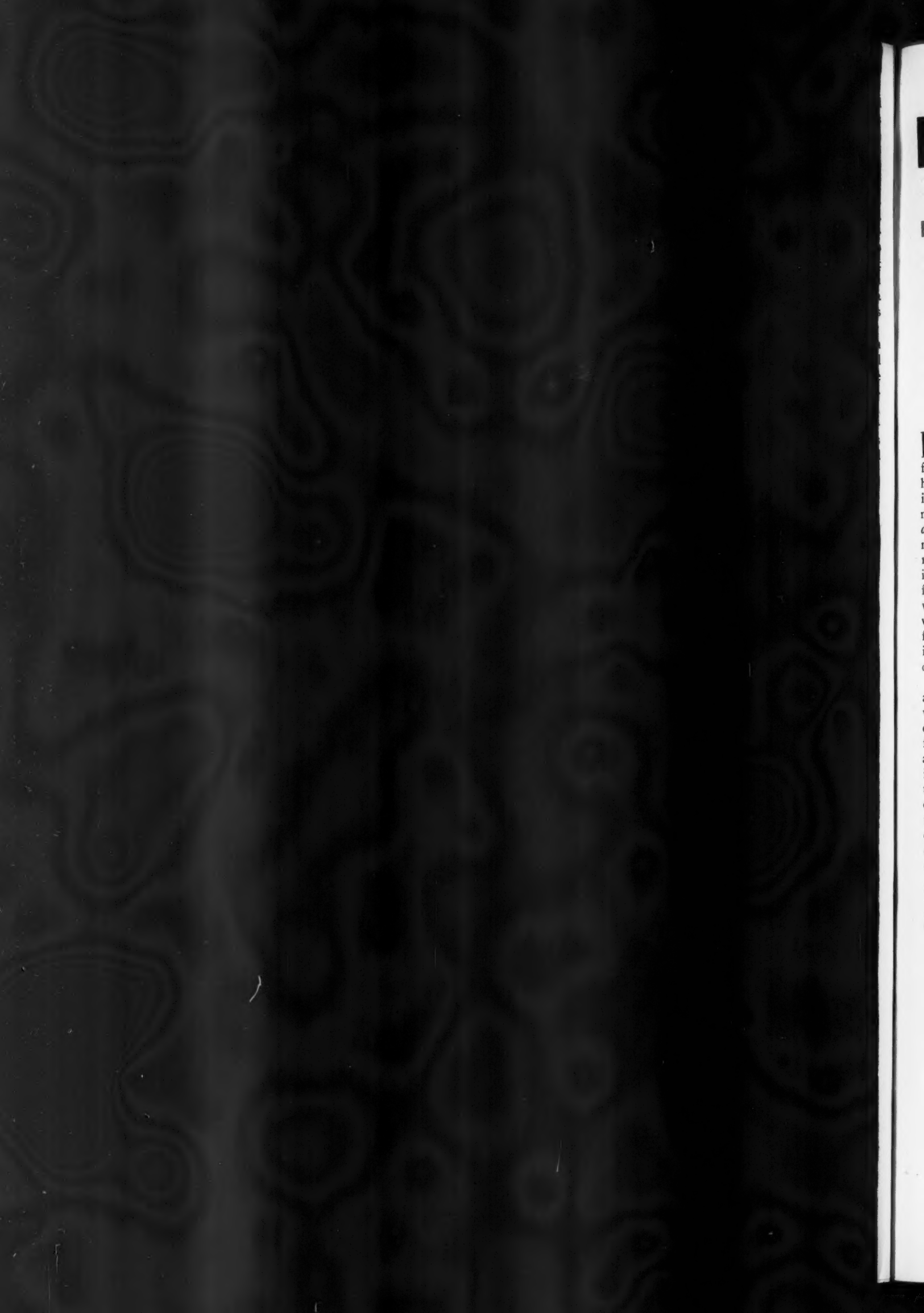
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Insulating Varnish—Selection, Use and Care

By George H. Brown,
President and Research Engineer
Insulation & Wires, Incorporated
St. Louis, Mo.

EVERY user of electrical equipment has the right to expect efficient performance of that equipment whether he is making a new purchase or buying repair service. Electrical equipment is built from a large variety of *different materials* and good equipment is good because the manufacturer really understands the job of combining materials correctly. Efficient performance of a machine depends on how well these materials get along together with each other. The equipment manufacturer always recognizes one very important fact, the limitations of each of the materials used.

After learning all there is to know about his materials, he wraps up the whole job in insulating varnish. Because it is applied last, most insulation failures and troubles when they arise are blamed on the varnish used. This, if for no other reason, makes varnish the most important link in the correct combination of insulating materials used in making or repairing good electrical equipment. World War II developed research into the best types of varnishes for given kinds of jobs. As a result, today more than ever, we have clearly defined types of varnishes and we have found good reasons for their use in different applications. We should give our varnish and varnish practice a 1948 look.

It would be wonderful as well as economical to have one or perhaps two varnishes to cover the whole field of uses, but it just doesn't work out that way.

Varnish Functions and Types

To better understand the subject, let's first find out why varnish is needed. Five distinct functions are performed by insulating varnish when applied to electrical equipment. They are:

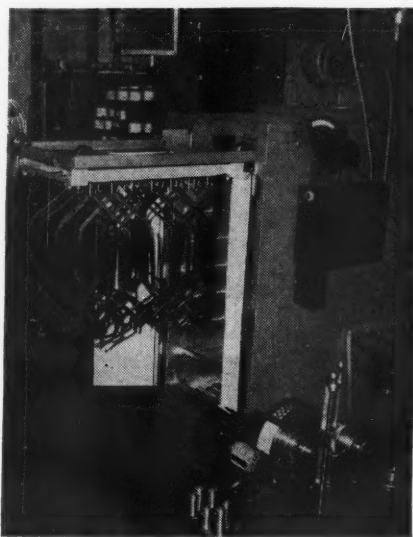
1. *To Provide An Adequate Mechanical Bond* (internal and external) to prevent the conductors in the winding from moving, and hence rubbing, due to magnetic and mechanical vibration.
2. *To Provide Chemical Protection* against moisture, oil, acid, alkali and abrasive dust.
3. *To Increase Thermal Conductivity* of the windings so that heat is carried to the outside of the motor and dissipated more rapidly.
4. *To Supplement Electrical Qualities* of other insulation used by increasing the overall dielectric strength of the winding.
5. *To Compensate For Limitations*

of other insulation used in the windings.

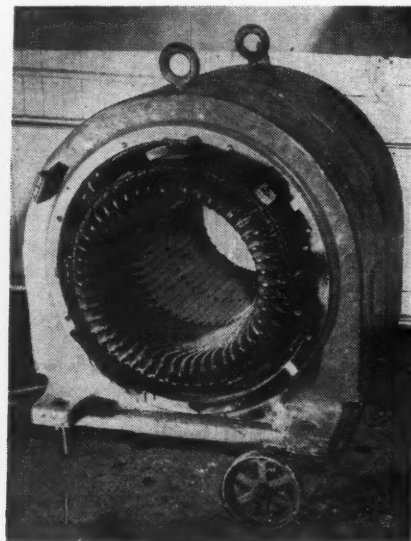
Insulating varnishes that have the above functional characteristics fall into five different types or categories. Each type and its reaction when applied is outlined briefly below.

Spirit and Naptha Finishing Varnishes made of base ingredients, resins and mechanical plasticizers, which are neither subject to oxidation nor polymerization by heat. When applied to windings, they are completely cured and ready for use just as soon as the solvent they contain (either alcohol or naptha) has been released by evaporation at room temperature.

Air Drying Insulating Varnishes which reach their maximum insulating value after thorough oxidation takes place. When these varnishes have been applied to the windings and the solvent has been released by exposure to air, the base ingredients remaining on the



A well ventilated oven with accurate temperature controls assures proper curing of the insulating varnish and a good baking job.



An electric motor is only as good as its insulation. Effectiveness of the varnish "wrapper" depends upon proper selection, application and baking.

coated surface are converted by the absorption of oxygen. This means that when they have taken up enough oxygen, the ingredients convert to a dry stage (were wet when applied) and are completely cured and ready for use.

Baking Insulating Varnishes which, when properly baked, become thermoplastic. These baking varnishes are so constructed that after application to the windings they must be subjected to reasonably high temperatures for various lengths of time in a well ventilated oven. This is necessary to (1) eliminate the solvent during the early part of the baking schedule and (2) permit polymerization of the base ingredients and conversion from soft non-resistant films into thoroughly cured and very resistant surfaces.

Don't let that word polymerization throw you. It's just an easy way of saying that the baking cycle results in the readjustment of size and arrangement of the molecules of the resins and plasticizers in the film from a partially reacted condition (which the varnish manufacturer set up at the factory) to a final form in the oven with maximum insulating and chemical resistance qualities. These varnishes remain flexible during their entire life and assure trouble free windings in most applications. Because they stay flexible, they are called thermoplastic. They soften whenever they are in the presence of heat.

Thermosetting Varnishes are known as the heat reactive resin type of varnishes. They are made with a very particular type of resin to get conversion to an infusible and unmeltable, very resistant film in the bake oven. This is accomplished by baking for a definite time at a definite temperature.

These varnishes are distinguished from the ordinary baking types (thermoplastic containing less reactive resins) in this respect: They develop their superior insulating, bonding and chemical resistance characteristics much more rapidly. They also differ in that their conversion to the dry film is due entirely to a chemical reaction between the particular resin and oil used as compared to the polymerization which takes place (due to time and temperature of baking) in the thermoplastic varnishes. Once baked they become infusible and unmeltable in the presence of heat.

Silicone Resins can also be applied and baked-out like varnish. Silicones are derived from sand, brine, coal and oil. The silicone found in sand combines with oxygen to give silicone products with exceptional heat stability, low water absorption and good dielectric properties. To the inorganic skeleton of alternate silicone and oxy-

gen atoms, various organic atoms derived from coal and oil are attached through the silicone atoms. These combined organic groups make the silicone materials easy to handle. Actually, a silicone resin for coil treatment is really a semiorganic material which has the advantages of inorganic materials like glass or quartz combined with the ease of handling of conventional varnishes. After curing by polymerization, the resultant film is inorganic and impervious to heat.

When picking an insulating varnish, the user should remember that there are at least twelve important factors to choose in a good varnish (Table I).

TABLE I
CHARACTERISTIC FACTORS
OF A BALANCED VARNISH

1. Penetration
2. Depth of Drying
3. Binding Properties
4. Softening Temperature
5. Insulation Resistance
6. Water-Proofness
7. Oil-Proofness
8. Alkali Resistance
9. Acid Resistance
10. Heat Endurance
11. Physical Toughness
12. Flexibility

Usually, if one or more of these factors is considered of greater importance than others it is quite possible that the value of one or more of the others may have to be lowered in order to improve those factors the user wants stressed.

When selecting an insulating varnish, after deciding on the necessary factors covered in Table I, the user should remember that these characteristics are to be chosen to meet the most important performance requirements of his electrical equipment. *The performance required determines the varnish characteristics needed.* Some requirements are listed in Table II.

Insulating varnishes are formulated to cover a wide range of applications and, therefore, varnishes vary for each of the factors shown in Tables I and II. The objective is to select a varnish having the best possible balance for the performance expected.

Correct Varnish Usage

After the insulating varnish has been selected for the job it is important that it be used properly. Good varnish application practice involves five important steps.

1. Preheating
2. Keeping varnish in good condition
3. Proper application
4. Proper draining
5. Proper baking

The fairly recent acceptance of preheating has proved to be a real factor in good varnish treatment. Equipment should be heated long enough to bring the temperature of the entire mass to 140°F. For a $\frac{1}{4}$ hp. motor this would mean heating for about 20 to 30 minutes at the regular oven baking temperature of 250°F. Both engineers and repairmen have found that, rather than being an "extra" in the treating process, preheating is actually a "must" because of the superior results obtained in the finished job.

Preheating has definite advantages because it:

1. Removes moisture from the winding before it is dipped in the varnish.
2. Expands the conductors and allows better penetration of the wet varnish as they cool and contract.
3. Reduces curing cycle due to increased rate of solvent evaporation because unit is thoroughly heated throughout.
4. Reduces possibilities of varnish pockets.
5. Heals checks (surface tension) of Formvar wire.

TABLE II
EQUIPMENT PERFORMANCE FACTORS THAT
DETERMINE VARNISH CHARACTERISTICS NEEDED

MECHANICAL

Magnetic vibration
Mechanical vibration
Breathing
Starts-stops
Reversals
Centrifugal force

THERMAL

Heat conductivity
Aging
Overloads

ELECTRICAL

Supplement the dielectric of other insulations used

CHEMICAL

Moisture
Acids
Alkali
Dust—magnetic abrasive
Oil
Grease
Solvents

6. Pulls varnish into winding by shrinking the air in the windings.

Most users of varnish do not realize that the treatment of the wet varnish while in their hands has very important effects on the varnish film applied to their equipment. *Good insulating varnish is a balanced chemical formula and improper care will upset its characteristics.* How to maintain this balance is outlined in Table III.

TABLE III

TO MAINTAIN VARNISH BALANCE

Keep Uniform Gravity—
Check morning and afternoon
Keep Uniform Viscosity—
Check morning and afternoon
Keep Uniform Temperature—
Minimum 50°F.; maximum 95°F.
Keep High Rate of Turnover—
Use the minimum size tank
Keep Varnish and Tank Protected

The objective is to maintain the proper relationship or correct balance between the non-volatiles (solids) and volatiles (solvents) at all times. This is accomplished by maintaining the solution at a uniform gravity, viscosity, and temperature. The solids used up should be replaced by fresh varnish and likewise the solvent used up must be added as needed. The rate of turnover of varnish in the dipping tank is very important; *the greater the turnover the more uniform the varnish treatment.* This would call for the use of a minimum size dipping tank. While some of these items may appear to be extra cautious, they are nevertheless proper for steady, daily usage of baking varnish.

Proper application of a varnish has a direct bearing on the quality of the finished job. Wet varnish can be applied by either of the following methods:

1. Hot Dip—When temperature of the units are 140°F.
2. Vacuum Impregnation
3. Immersion—Cold
4. Brush or Flow
5. Spray

Varnish must have a path to its destination. If that path is blocked by moisture, air, oil, grease, etc., the purpose of complete saturation will be defeated. Units should be completely immersed in the varnish only for the period of time necessary for thorough penetration. *It is most important that units should not be in any varnish longer than necessary.* The period will vary based upon wire covering, design of unit, type of insulation, etc. For example, plain enameled wire will take up about half of the varnish in the first dip that a fabric-coated wire

will. However, the pick-up of varnish in subsequent dips is about the same. Large units, because they retain heat longer than small units, should be allowed to cool until the temperature is approximately 140°F. A virtually fool-proof rule-of-thumb method: See that the units remain submerged in the varnish until all bubbling has ceased. Then immediately withdraw the units.

Draining is another important factor in the proper usage of insulating varnishes. This step removes excess varnish and prevents "wet pockets" (See Table IV).

TABLE IV

HINTS ON USE OF WET VARNISH

APPLICATION

Hot Dip—when temperature of units is 140°F.
Vacuum Impregnation
Cold Immersion
Brush or Flow
Spray

DRAINING

Remove equipment from varnish at slow uniform rate
Drain at room temperature to:
Remove excess varnish
Prevent wet pockets
Keep oven draining to minimum
Reverse position of winding for better surface distribution of varnish film

BAKING

Use a well ventilated oven
Be sure of uniform temperature control
Thermoplastic—250° to 260°F.
Thermosetting—275° to 285°F.
Don't over—or under-bake—use only correct curing time

The distribution of varnish after the capillary action of absorption ceases is strictly mechanical. Uniform distribution of varnish results in maximum protection and better balance. This explains why many users reverse the units, particularly armatures, in a vertical position after dipping and par-

tially draining but before placing them in the oven.

Baking is the final step involved in correct use of insulating varnishes. This very important operation should be carried out in a well-ventilated oven with sufficient air changes to readily remove the solvent vapors. *Curing is not effective until these gases are not only removed from the unit but also from the oven.* Varnish curing is the product of time and temperature, two variables that are dependent upon type of varnish, depth of windings, etc. The objective is to properly cure and polymerize the varnish in the deepest part of the winding and at the same time eliminating the possibility of over-baking.

Unfortunately, in many instances ventilation of an oven and control of baking temperature are more critical than the user, or for that matter the varnish maker, thinks. The conventional type baking varnish usually cures at 250°F., and the baking temperature of the heat reactive type or thermosetting varnish is 275°F. The period of cure is in direct proportion to the temperature—that is, *if the temperature is elevated, the curing period can be reduced.* Likewise, if the temperature is decreased, the curing period must be lengthened. It is just as detrimental to over-cure or "cook" a varnish as it is to under-cure.

Care of Insulating Varnish

Quite often controversies arise between the varnish user and the varnish manufacturer as to the condition of varnish in the user's plant. Many of these discussions would be avoided if users, generally, were more familiar with a number of factors which the varnish makers mistakenly believe every user has in his storehouse of knowledge. Experience has shown that the eight most common causes of disagreement are:

1. Use of improper solvent, for instance using coal tar types when the varnish requires petroleum types.

TABLE V

HINTS ON CARE OF INSULATING VARNISH

Use Only Proper Solvents—do not substitute coal tar types for petroleum types
Keep Varnish From Freezing—30°F. usually produces livering
Don't Use Too Large a Dip Tank—unit should hold only one week's supply
Beware of High Varnish Temperature—prolonged dipping of units over 140°F. thins varnish; makes solvents more active
Prevent Aging of Varnish—turn varnish over in tank regularly and completely
Prevent Oxidation of Thermoplastic Types—keep dip tank covered when not in use
Prevent Emulsification—moisture emulsifies varnish as oil absorbs moisture faster than resins. Prevent radical temperature changes in buildings where varnish is used

2. Use of hydrogenated naphtha (80 percent coal tar, 20 percent diluent) which is not VMP Naphtha.

3. Freezing of varnish in cold weather during shipment or in the users tank. Livering usually occurs at 30°F.

4. Dipping tank too large. It should hold one week's supply only.

5. Varnish temperature too high. Prolonged dipping of units that are over 140°F. will thin varnish and make solvents more active.

6. Old age. Varnish must be turned over in the tank regularly and completely.

7. Oxidation of thermoplastic types—by allowing dipping tank to remain uncovered when not in use.

8. Moisture emulsifies varnish as oil absorbs moisture faster than resins. Radical changes in temperature in cold weather (due to unheated buildings at night or over weekends) will cause varnish to pick up moisture.

Solvents must necessarily be used in varnishes and vary in their cutting power and do effect enameled wire. They can be considered as necessary evils not only because of the film attack possibility but because curing cannot take place until the solvent vapors are removed from the baking oven.

The most commonly used solvents are petroleum types such as VMP naphtha, mineral spirits, etc.; and coal tar solvents such as Toluol, Xylol, and others. The cutting power of petroleum solvents is considerably lower than the coal tars. They will cut the gums and oils of conventional varnishes but do not have adequate cutting power for the heat reactive or synthetic type varnishes. It is for the latter group of varnishes that the coal tar solvents must be used.

Even VMP naphtha, under certain conditions, has a softening effect on conventional enamel. The finer the wire and the thinner the film thickness the greater the possibility of attack. The resistance to solvent of Formvar is many times greater than that of conventional "black" enamel. Recognizing the possibility of solvent action, the

varnish user should aim to *keep the period of association of windings with the solvent at a minimum*. Each unit to be treated has a maximum volume capacity for varnish and there is nothing to be gained by a longer period of

immersion in wet varnish than is necessary. This period will vary with the type of wire, depth of unit, and its design, but can usually be recognized as having been reached when bubbling ceases.

TABLE VII

FREQUENTLY USED VARNISH TERMS

Gravity —Pull toward center of the earth
Viscosity —Stickiness or adherence of molecules to one another
Polymerize —Change size and shape of molecules of matter
Volatile —Readily vaporizable
Dielectric —Non-conductive strength (resistance to electric current)
Alkali —Caustics like sodium hydroxide, lime, magnesia
Plasticizers —Materials used to make brittle films very flexible
Hydrogenate —Combine with hydrogen
Oxidation —Combine with oxygen
Emulsify —Oil becomes suspended in another lighter liquid in small globules

TABLE VIII

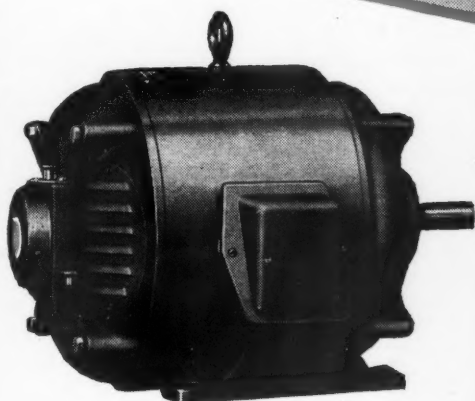
SOME INGREDIENTS OF GOOD VARNISHES

Ingredient	Origin and Properties	Used
Specially Treated Linseed Oil	Comes from Flax Seed, Northwestern United States, Argentina	In clear air-drying and baking varnishes of medium price range
China Wood Oil (Tung Oil)	Comes from Tung Nut kernel. Cultivated in the South; grows wild in China	Where flexibility, durability and water resistance is important
Caster Oil	Comes from Caster Bean; generally grown in the U. S.	As a plasticizer for adhesives, bending agents and similar materials
Cresylic Acid	Comes from a patented synthetic	In manufacture of special resins; also as a strong solvent
Formvar Resin	Comes from patented synthetic	In manufacture of Formvar Wire enamel
Coal Tar Solvent	Comes from coal	For thinning varnishes for proper application
Petroleum Solvent	Comes from oil	For thinning varnishes for proper application
Orange Shellac	Comes from the secretion of a bug in India	As a fast drying coating, core plating, benders and adhesives
Heat Reactive Resins	Comes from: Phenolic from coal, Phenol and Catalin	In hard setting heat-proof varnishes with extremely good bonding properties
Bakelite Resin 100% Phenolic Resin	Comes from coal	As clear finishing varnish, baking and air-drying; has excellent life, durability and water resistance
Modified Phenolic Resin	Comes from coal	In varnishes of air-drying type, may be modified with other resins to obtain desired results
Gilsonite	Naturally mined in Utah; is jet black and durable	In black air-drying and baking varnishes
Congo Resin	Comes from Belgian Congo; is a very hard fossilized mass	Where extreme toughness and flexibility are required
Synthetic Resin	Comes from coal principally (alkid)	In manufacture of protective coatings, sealers and finishes requiring flexibility and excellent life

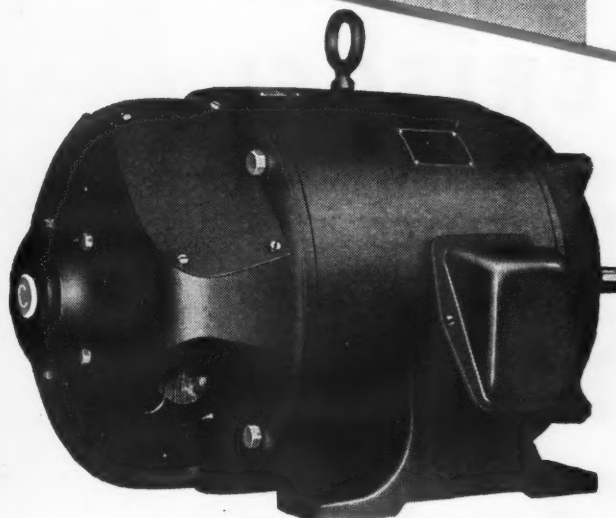
TABLE VI

WHERE TO USE WHAT VARNISH

Type of Varnish
Thermosetting
Thermoplastic
Air Drying
Spirit and Sealer Types
Application
All rotating equipment
Field coils, transformer coils, etc.
On units which baking would damage
A high grade finish coat over baked varnishes for further protection



Illustrates Century 3 horsepower
type RS and smaller motors.



Illustrates Century 7 1/2 horsepower
type RS motors.

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The wire size and thickness of insulation film are influencing factors. Obviously there is a greater danger of attack on fine, plain enameled wire than there would be on heavy enamel magnet wire with its heavier film thickness. Particular care should be given to the varnish treatment of plain enameled wire in sizes No. 30 and finer. This does not mean that the user should totally ignore the sizes between No. 30 and No. 20 either.

The fact that the possibility of attack exists does not mean that the action will take place. But one should be cautious. It is true too, that the varnish temperature has a great bearing on the possibility of attack.

There is a difference between softening of enamel on wire and a separation of the film from the copper. Wire enamels, being thermoplastic, are set up again as a result of subsequent baking. Experience has shown that, on average size units, successful results are obtained when the minimum period of immersion has been established and the varnish temperature is within the recognized limits for that specific varnish. The old adage—if a little is good, more is better—definitely does not apply to length of varnish treatment. (Average curing cycle on No. 30 conventional plain black enameled wire: Temperature 1,000°F., 50 feet per minute through a ten-foot high oven).

There is no hocus-pocus about matching the varnish to the job. In fact, there is a pretty well defined formula as shown in Table VI.

Today, varnishes are available to give every type of electrical equipment the best treatment required. The user must decide on the factors of protection he thinks most important, and temper this requirement with the performance characteristics of the equipment he is treating. After recognizing the limitations of his shop equipment for applying the varnish, he is ready to say "this is it".



Lighting system design is one of the responsibilities of electrical engineers Luther R. Fohl (left) and Donald L. Westhoefer of Hilscher-Clarke Electric Company, Canton, Ohio contracting and engineering firm.

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A transformer or coil can be protected because the long time-lag of the Fusetron permits it to hold all normal current surges and harmless overloads — yet it will open to prevent burnout on any dangerous overload.

A solenoid, likewise, can be protected because the Fusetron will not open on the operating surge but will open in time to protect should the heavy current continue too long for any reason.

Burnouts mean costly and troublesome repair or replacement jobs. Why take a chance on crippling your operations?

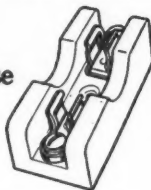
Here's All You Need

TO PROTECT COILS, SOLENOIDS, TRANSFORMERS.

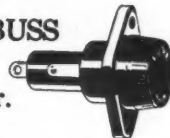
A Fusetron of proper size,



plus a fuse block—



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QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

Reader's Quiz

Wiring For Garages

Q *QUESTION 273—Not being able to obtain conduit and fitting, I installed a 60 amp. service with entrance cable and ran into the office of a garage. The power company made the service hot and then the inspector did not pass it.*

The 1940 Code book says not all parts of a building are necessarily hazardous so that the garage office could not be considered a hazardous location, could it?—V.E.T.

A. TO QUESTION 273—In a garage building, the working area (that part used for the storing or repairing or lubricating automobiles) is considered as being hazardous from the floor level to a point four feet above the floor. Section 5103 of the 1940 National Electric Code states that in the above area the installation of 'arc-producing' equipment shall be in the manner described for a hazardous location or by methods as given to be acceptable such as in the first three paragraphs (a, b, and c) of the section.

However, in the fourth paragraph (d) of the same section, there is an exception that would seem to cover the question raised by V. E. T. This paragraph d states as follows:

d. "Showrooms and Switchboard Rooms.—Equipment located in a show room separated by a partition from the garage proper, or in a room or enclosure provided for the purpose, need not conform to the requirements of paragraphs a, b, or c of this section."

This statement definitely classifies an office—if properly partitioned from the working area—as a non-hazardous location, and correct for a service entrance location. Note: There are two loop-holes for the inspector in ruling this installation:

1. In some localities the inspector does not have to stick by a 'code' ruling or regulation, but can form his own opinions and rules to go by and to have followed by contractors.

2. In the first part of V. E. T.'s question, he states that he used service cable instead of conduit.—Section 5102 of the code gives a list of accepted types of wiring for garages, and service cable is not listed. This is a mere technicality that could possibly be used if a fine line is to be drawn by the inspector.—W.R.S.

A. TO QUESTION 273—V. E. T.'s problem will be answered under Article 510, sections 5101 and 5157 of 1947 N. E. code.

Sec. 5101 states that "The provisions of this Art. shall not apply to any portion of a building which is suitably cut off from the garage and not used for the above purpose."

Sec. 5157 states that "In office buildings and other building units isolated by location and in which no gasoline or containers are used or stored, the wiring shall comply with the provisions of Art. 300 of this code."

I suggest he check into city ordinances governing Service Entrance equipment for commercial buildings.

The N. E. code permits the installation V. E. T. put in.—L.J.G.

A. TO QUESTION 273—From the wording of the question it appears that this garage should be classified as a commercial garage. Section 5102 of the 1940 National Electrical Code and section 5131 of the 1947 National Electrical Code list the types of wiring which may be used in commercial garages. Neither code permits the use of service entrance cable in such locations.

The definition of garage covers "a building or portion of a building in which one or more self-propelled vehicles carrying volatile, flammable liquid for fuel or power are kept for use, sale, etc." There is also a statement that this includes "all that portion of a building which is on or below the floor or floors on which such vehicles are kept and which is not separated therefrom by tight, unpierced fire walls and fire-resistive floors."

There is also a provision in section 5103d of the 1940 National Electrical Code or section 5103a of the 1947 Na-

tional Electrical Code which indicates that in show rooms and switchboard rooms separated from the garage proper, the requirements covering equipment such as cutouts, switches, receptacles, etc., do not apply. This does not cover the wiring material so that the inspector was justified in making his decision.—J.E.W.

Commutators

Q *QUESTION 274—What would cause a 4000/2000 ampere 2/12 volt plating generator to have an unbalance of current division between the two commutators of this one generator with one common field? That is the brush rigging on one side of the generator seems to give more current than the other side with which it is paralleled. What is the remedy?—E.K.*

A. TO QUESTION 274—Electroplating processes require a direct current source of low voltage. Although the use of current densities as high as 300 or 400 amps per sq. ft. have shortened the time necessary for obtaining a lasting and attractive coating, the possibility of voltage drops which may considerably affect the terminal voltage of each armature has been increased.

In the present case, it is assumed that the two commutators originally shared the load equally. The recent inequality of their terminal voltages may therefore be due to one or more loose connections or improperly selected new set of brushes on one commutator. Loose connections resulting in unduly high contact resistances may occur at the commutator connections of winding risers; at the connections of the brush shunts, collector or terminal leads; and at the equalizer connections on the commutators. The improper selection or maintenance of brushes and brush-holders may also cause the inequality of loading. The brushes on the two commutators must



1 300 B.C.—Crude elevators like this helped primitive farmers store grain in bins above ground. Hand operation was the rule though animal power, even water wheels, were used.

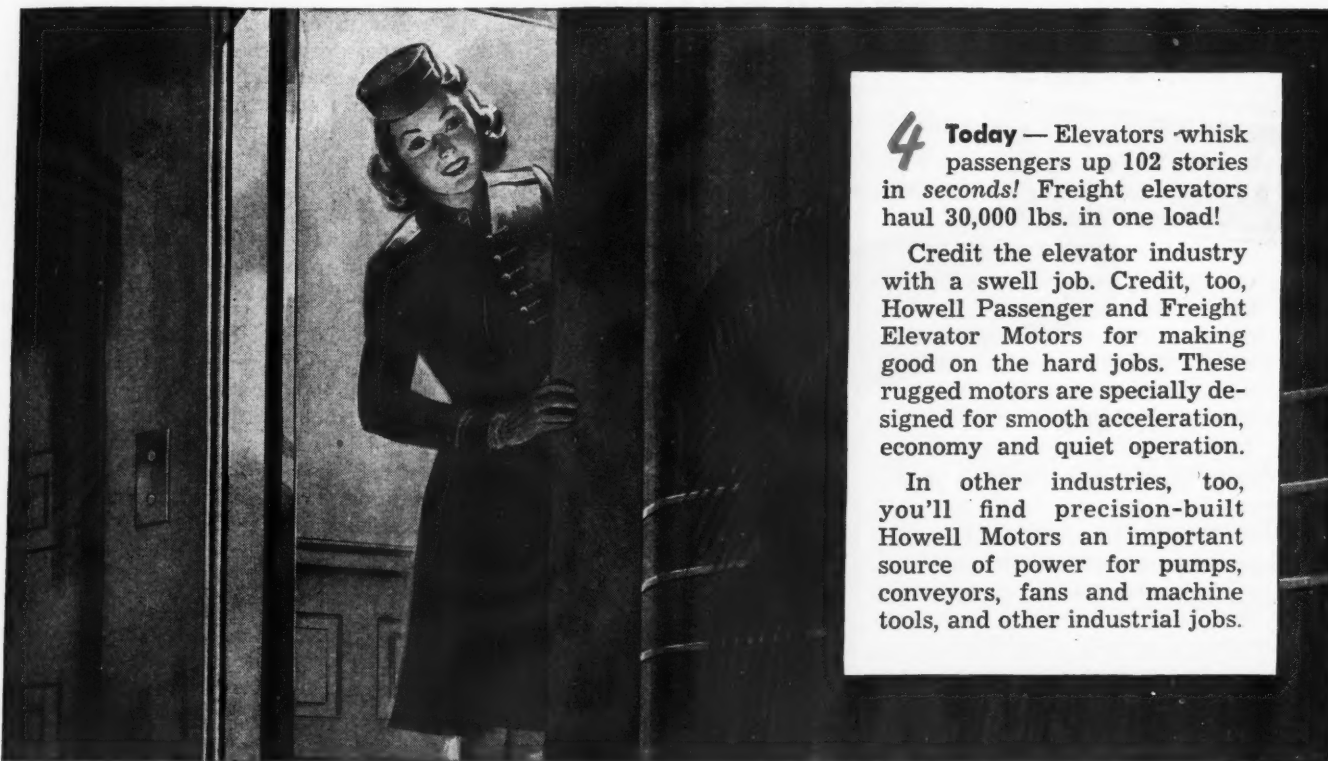


2 1850—First elevator in America operated between two floors only. Use of elevators got the first big boost in 1890's with the advent of low-cost electricity and better safety devices.



3 1915—Howell "Red Band" Motors arrived. These rugged, industrial-type electric motors together with safer, stronger, faster elevators ushered in the new era of skyscrapers.

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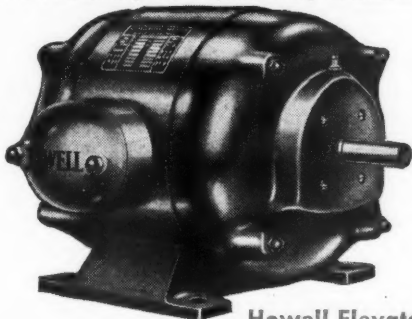


4 Today — Elevators whisk passengers up 102 stories in *seconds*! Freight elevators haul 30,000 lbs. in one load!

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be of the type equipped with shunts and be of the same special copper-graphite grade. They must move freely yet snugly in the holder boxes. Brush tension must be properly and uniformly adjusted by means of the adjustable finger and spring. A close inspection of all connections in the commutator circuit delivering the lesser share of the load current should disclose the cause of the unequal current delivery.—R.G.C.

A. TO QUESTION 274—The cause for this generator to divide the load unequally is unequal voltage.

Since this machine has a common field the generated voltage in the two windings will be the same; however, it is possible to have more voltage loss at one commutator than the other and thus cause unequal load division. Also, if the leads from the commutators to the paralleling point are of different lengths this will cause unequal voltage loss with the resultant unequal load division.

See that the commutators and brushes are in good condition and the leads to the paralleling point are of equal size and length.

As a last resort, a series resistor of proper value and capacity, depending upon the amount of unbalance, can be connected in series on the side of the generator taking the larger portion of the load to equalize the load on both sides of the machine.—J.H.P.

A. TO QUESTION 274—We had a similar experience with an eight thousand ampere job.

The trouble with the particular generator in question is that the electrical neutral position and the brush neutral position do not coincide. One brush axis possibly is ahead of the other causing an unbalance of voltages and consequently, an unbalance of currents.

To remedy this situation, the electrical axis and brush axis on both commutators must coincide.

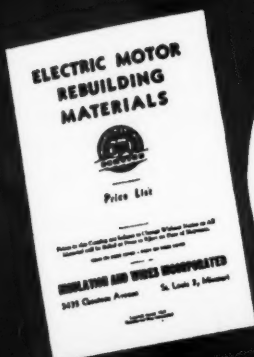
If the machine is shut down with one set of brushes lifted and the field is broken, a voltage will be generated across the brushes. (This is assuming that the generator field can be excited from another source.) Place a low reading voltmeter or milliammeter across the brushes. Move the brushes until there is no deflection of the meter. This is the electrical neutral. Raise the brushes on the first commutator and lower the brushes on the other commutator and repeat the process of flashing the field.

This should give balanced currents on both sides. Should some sparking exist if there are no interpoles on your machine, it may be necessary to advance each side slightly making sure both sides are advanced the same.

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If one has a clamp or "long test" ammeter which reads direct current a simple method of balancing the currents is available. Simply clamp on the ammeter to the brush lead and take reading. If the meter reads off scale, place a piece of wood between the jaws. Move the ammeter to the other brush lead and take reading. If the readings vary move the brushes until the readings are the same.—J.E.C.

A. TO QUESTION 274—Apparently, this question has to do with a 3-wire generator. Since there is only one set of field coils, it seems that the voltages in the two circuits should be equal unless there are some short circuited coils in one part of the armature. If this is not the case, there must be a difference in the resistance of the two circuits. With the low voltage the circuit resistance must be low and a slight increase, due to poor joints or splices or to poor joints or splices or to poor brush contact (if the brushes do not fit the commutator properly) may cause the variation.—J.E.W.

Selecting Capacitors

Q QUESTION 275—In regard to single phase capacitor start split phase fractional hp. motors, will someone please explain how to figure needed capacity in microfarads? Example: In case a motor comes in for repair minus capacitor, what is the best method for obtaining correct capacitor? Is there some instrument obtainable for this purpose?—J.D.B.

A. TO QUESTION 275—Here is the formula that is used in figuring capacitor size for 60 cycle:

$$M.F.D. = \frac{2650 \times \text{amperes}}{\text{applied voltage}}$$

Another simple method is to obtain the various capacitor companies' catalogs. These catalogs list the largest percentage of capacitor motors on the market today and the ratings of their capacitors. There is still a further method of selecting capacitors, this method needs a supply of capacitors and a voltmeter. Place a capacitor of approximate size, guessing if you have to, in its proper place in the circuit with a voltmeter in parallel. Start the motor, if on start the voltmeter registers over 138 volts for 110 volt motor (110 percent of rated voltage for other voltages) the capacitor is too small, if it takes over 3 seconds for the motor to come to speed it is either too high or too low.—L.R.D.

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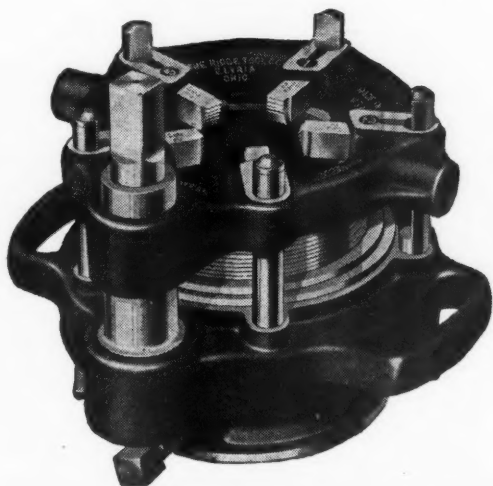
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A. TO QUESTION 275—The correct size capacitor for a capacitor start split phase motor is the one that gives maximum starting torque. For any particular motor this may be determined experimentally by a relatively quick and easy method. Clamp the motor to a bench and secure a torque arm to the motor shaft. This arm should be about a foot long and attached to the motor shaft in a horizontal position and at right angles to the axis of the shaft. A spring balance is used at the extremity of the torque arm to measure relative amounts of locked rotor torque. Try different values of capacitors on the motor and get a locked rotor torque reading for each. Each test should be of as short duration as possible to avoid overheating the windings and weakening the capacitor. The capacitor giving the greatest torque is the proper one to use for that motor. If two different size capacitors give approximately the same torque, use the larger one; the condenser voltage will be less. Condenser manufacturers make variable capacitors which are very convenient for the test described above. These devices may be varied in several steps from about 75 mfd. to 450 mfd.—M.A.W.

Can you ANSWER these QUESTIONS?

QUESTION A13—Can someone suggest a simple way of slowing down an electric clock (self starting synchronous) motor which gains 10 minutes in 24 hours?—E.J.K.

QUESTION B13—Will two transformers connected open delta supply you with three E.M.F.'s, 120° apart the same as a three phase generator?—W.H.L.

QUESTION C13—During a recent discussion regarding voltages on a 3-phase, 4 wire system, we connected up three single phase, 1 kva. 120/120 volt transformer in Y-Y. The primary voltages were exactly alike and did not change. In the ground from neutral of the secondary we connected a knife switch. When the switch in this circuit was opened, the voltages between phases were greatly different but when it was closed the voltages immediately equalized themselves. There was no load on the secondary. Will someone please explain this.—L.W.K.

PLEASE SEND IN YOUR ANSWERS BY MAY 15

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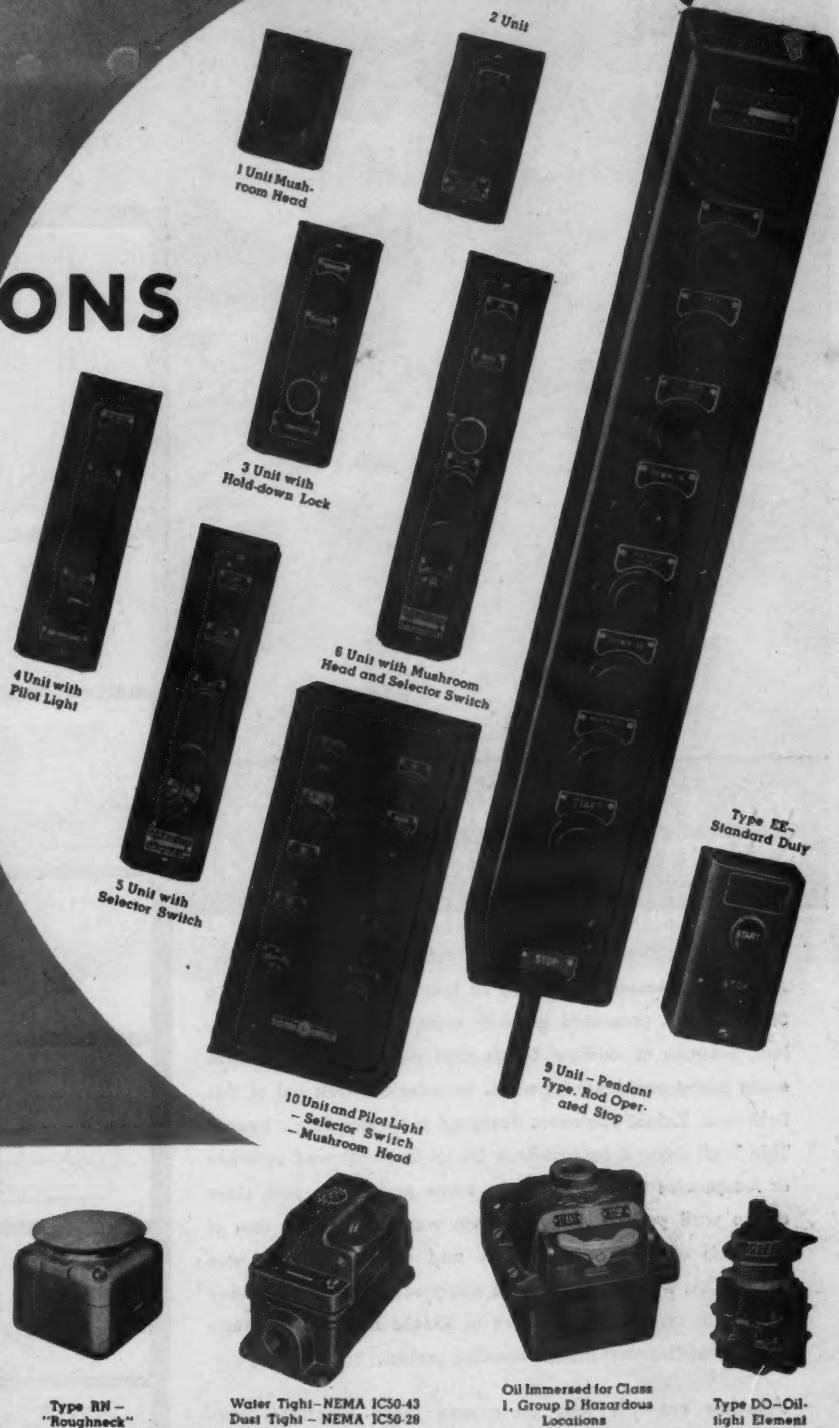
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commutators. The Kirkwood Commutator Co.

(36) CRANE CONTROL — Three-color folder discusses new principle for a-c cranes that eliminates mechanical load brake. Bulletin C-39. Harnischfeger Corp.

(37) V-BELTS — Two-color 16-page catalog on V-belt drives with drive data, dimensions, list prices and performance information. Transmission Machinery Corporation.

(38) WALL CHARTS—Illustrations for equipment such as switches, short circuiters, brush holders, mounting rubbers, pumps, wedges, condenser units, thermostats and motors. Harco Equipment Co.

(39) LIGHTING EQUIPMENT—Booklet discusses "Planned Lighting Equipment for Creating Outstanding Stores" includes show window units, wall case assemblies and accent lighting fixtures. Edwin F. Guth Co.

(40) VOLTAGE REGULATORS — Six pamphlets analyse applications, circuits and construction of a-c voltage regulators and Nobatrons. Sorensen and Co., Inc.

(41) CONNECTOR SELECTOR — Quick-reference novelty catalog, "Connector Selector", indexes terminals, taps, T-connectors and splices for fast selection. Burndy Engineering Co.

(42) WIRES AND CABLES—Non technical ready-reference booklet pictures, discusses and charts complete selection of electrical cables and lists construction and application of each. Simplex Wire and Cable Co.

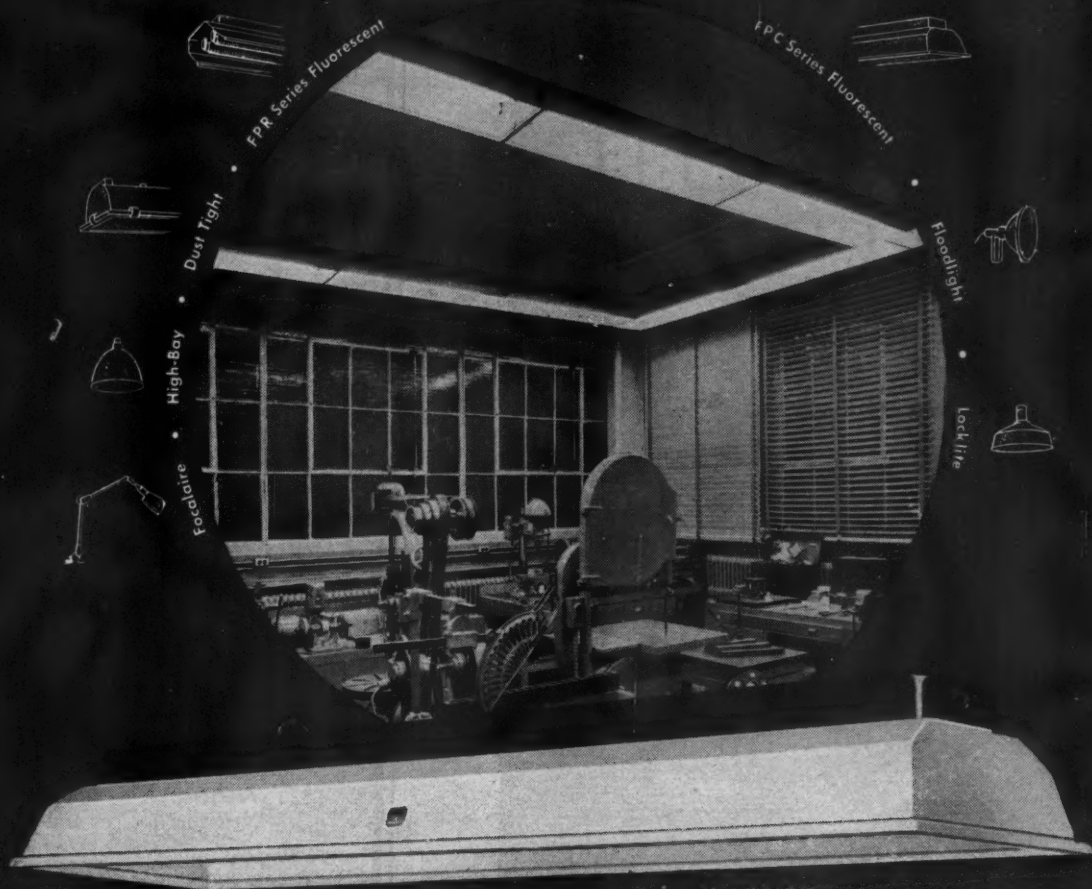
(43) TIME SWITCH — Three-color folder shows construction, regulation features and specifications of small sized time switch type S. Sangamo Electric Co.

(44) GRINDER—Folder contains descriptive text and photographs to present features of small tool grinder featuring rapid change wheels, speed selection and other advantages. Corlett-Turner Co.

(45) SWITCHES—Data sheet 41 and folder No. 2 discusses precision switches. Micro Switch.

(46) OUTDOOR REGULATOR — A 24-page bulletin presents features of outdoor, self cooled, three phase, 60 cycle, feeder voltage regulator. Allis Chalmers.

(47) SOUND FILMS—Booklet B-3988 describes sound motion pictures and



Closed-End Fluorescent Luminaire

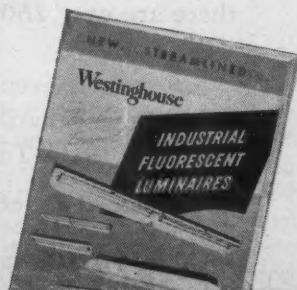
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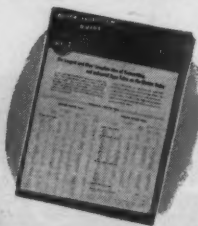
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slide films available for industrial and civic use. Films cover electronics, radio, RF heating, research, maintenance and safety. Westinghouse Electric Corp.

(48) HAMMER AND DRILL—Pamphlet lists helpful suggestions on the use and maintenance of combination electric hammer and drill. Wodack Electric Tool Corp.

(49) EXCESSIVE HEATING — Two pamphlets discuss "Why Circuit Breakers trip out and Fuse Links melt out" and "Excessive Heating of fuses in Enclosed Switches, Panelboards and Cabinets". Frank Adam Electric Co.

(50) AIRPORT LIGHTS—Bulletin GEA 4952 includes photographs, construction drawings and assembly details of medium intensity, elevated, runway, strip and taxiway marker lights. General Electric Co.

(51) TRANSFORMERS — Construction, operation and application of network transformers is discussed in 24-page booklet. Bulletin 61B6152A. Allis Chalmers.

(52) TIMING — Synchronous timing motors, timing devices and clock movements are subjects of 2-color 16-page catalog containing photographs, drawings and listings of speeds, voltages, frequencies and other data. Haydon Co.

(53) POWER TRANSFORMERS—Bulletin 47A describes Electran step-down air-cooled transformers for power circuit installations. Electran Manufacturing Co.

(54) WIRING DEVICES—Bulletin 16 presents wide range of wiring devices and watt-hour meter protectors. All devices are diagrammed and discussed in detail. M and W Electric Manufacturing Co., Inc.

(55) SAW BLADES—Wall chart is large 2-color aid for selecting proper hand, band or power saw blade to use for cutting any type of metal and pictures right and wrong way to use blades. Victor Saw Works, Inc.

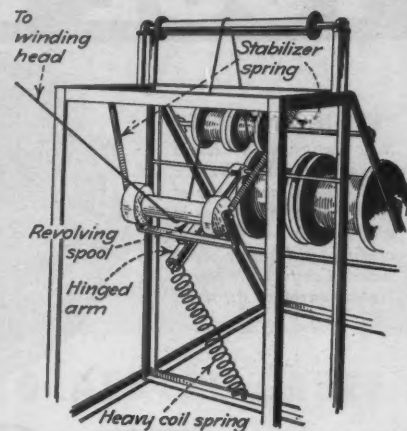
(56) COLD CATHODE — Booklet includes wiring diagrams, specifications, mounting details and diagrams of fixtures for slimline and cold cathode lighting. Illuminating Engineering Co.

(57) CONTROLS—Folder presents principles and operation of induction relays, switches, enclosures, starters and multiple pump controls. B/W Controller Corp.

Motor Shops



Exhaust hood behind lathe at bed level removes metallic vapors when armature shafts are built up by metal spraying at the motor repair shop of Price Electric Co., Columbus, Ohio. Duct opening is 44-in. by 12½-in., connects to exhaust system for burnout oven at left. Exhaust fan is powered by a 1½-hp., 3-phase, 220-volt, 1800 rpm. motor.



Showing mechanism of the jerk arm.

Jerk Arm on Wire Rack

The ordinary aluminum winding head arm has a radius of about 12 inches. As this revolves at high speed, the jerk on the wire leading from the spool is terrific. In order not to break the wire or get the whole rack to vibrating at a dangerous rate, it is necessary to hold the speed down.

To counteract this slap, the Bay City Electric Works, of San Diego, Calif., designed the jerk arm seen in the sketch, mounted on the wire rack. A revolving spool is mounted on a hinged jerk arm as shown. A heavy coil spring under the arm takes up the jerk at each successive revolution of the winding arm. The two vertical springs are light ones designed merely as stabilizers to counteract the weight of the assembly.

Robert Norris and his son Charles operate the company and Charles said that when they built this particular piece of equipment it was considered experimental, only, and they expected they would have to rebuild it to get the bugs out. However, it worked so well they did not find it necessary to make any changes. They can now run the winder at a much higher speed than ever before.

Key Stock Guide Eliminates Errors

Anyone who works as a machinist knows the possibility of making errors in reading and transferring measurements from blueprints to the stock being processed, or misreading the machinist's rule. To reduce this possibility to a minimum, William E. Berkel, machinist at the Giles Armature & Electric Works, Inc., Marion, Illinois, devised a key stock guide, for use on motor shafts, that is practically foolproof.

Entered in the 1947 Award Contest of the National Industrial Service Association, this idea has been released through the courtesy of the NISA Award Committee.

The guide is a piece of ½-inch key stock cut to the exact length of the finished shaft. On one of the four

surfaces marks are scored with a sharp chisel to indicate shoulder distance and shaft diameters are stamped with steel numbers. Key measurements are stamped on a second side of the guide. Tapers, threads, etc., are indicated on the third side. The fourth side is used for shaft number identification and other pertinent data.

All measurements are transferred from the guide directly to the work piece by clamping the key stock to the shaft steel and center finishing the measurements.

A small hole drilled through one end of the key stock facilitates storage. Numerous guides can be placed on steel pegs for quick and ready reference.

With the use of these recurrently-used stock guides, it is unnecessary to keep blueprints on the bench, thereby retaining the original drawings in good condition for longer periods of service.

← 5/8" x 3/16" key →		← 7/8" x 3/8" key →				
3/4" taper	3.491	3.5433	4.000	3.256	3.222	2.7559
2.520 2.755						

Sketch of keystack guide showing some of pertinent data stamped thereon. Device reduces human error in transferring dimensions to shafts being turned.

KLEIN TOOL BELTS

"KLEIN-LINE" BELT

New design with "Klein Kord" Sliding Trace that allows movement of approximately 6 inches in either direction. Reduces chafing and safety strap wear. Comfortable latigo leather cushion. All sizes.



"KLEIN-KORD" BELT

Made of "Klein-Kord," the material made famous by Klein Red Center Safety Straps. Wide, comfortable fabric cushion. All sizes.

★ To the lineman a fine tool belt is more than a necessity—it is a proud possession that assures safety, comfort and convenience—is essential to efficient work.

Klein Tool Belts—favorites among linemen—are made in a range of styles and sizes to suit individual preferences and requirements. Advantages of Klein Belts include tested "Dee" rings drop forged from the finest steel . . . hand-set rivets of solid copper . . . lock stitched sewing with hot waxed thread . . . convenient tool loops . . . plier pocket, tape thong and knife snap.

Illustrated here are two recent additions to the complete line of quality Klein Tool Belts—the "KLEIN-LINE" Belt with the sliding trace and the "KLEIN-KORD" Belt made of multiple plies of long staple cotton vulcanized in rubber.

To assure the last word in comfort, convenience and safety be sure to specify Klein Tool Belts.



Ask Your Supplier
Foreign Distributor: International
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A copy of the Klein Pocket Tool Guide, showing the Klein line and containing valuable tool information, will be sent on request.

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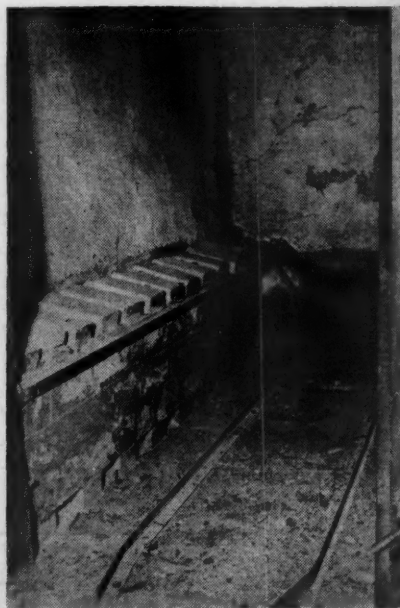
Walk-in Burnout Oven

Burning out stator coils before stripping has been a subject of considerable discussion among motor repair shop operators for some time. Some shops still use the old hand torch method, others have designed various types of ovens or incinerators that use the same principle of applying flame direct to the windings. A few shops have designed electric ovens producing high temperatures that ignite the stator windings which then burn out.

This self-ignition feature is used in the new gas-fired burnout oven de-



Walk-in burnout oven is fired by two heavy natural gas burners. Interior gas chambers heat oven air to a maximum of 800 to 900 degrees F. Winding ignites (temperature depends on windings) and normal combustion of insulation completes burnout job.



Interior of oven showing construction of gas chamber. Angle iron on floor centers roll-in truck between two gas chambers.

FOR OVERHEAD SERVICE LINES

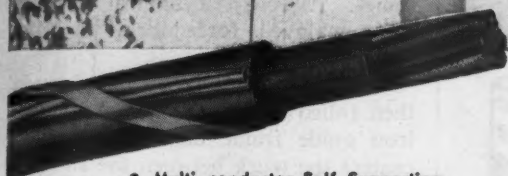
THAT GO UP FAST

PREVENT LINE TROUBLE

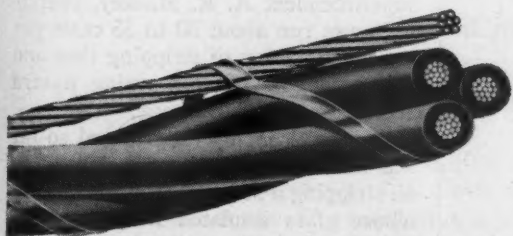
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- Three-conductor Self-Supporting Aerial Cable. Hazaprene protective jacket on each conductor makes splicing and terminating simple and fast.

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With Hazard Self-Supporting Aerial Cable, specially compounded Submarine rubber insulation provides long-lived, moisture-resisting, electrical protection for the Hazaloy coated copper conductors. Over this insulation goes a tough Hazaprene jacket that's well known for its unusual resistance to sun, cold, moisture, abrasion.

Bound to the cable by a spirally wound metallic tape, a strong copperweld messenger gives full support between points of suspension. This simple, but effective *all-in-one construction* (cable, messenger, binder) of Hazard Self-Supporting Aerial Cable provides the ideal answer to the problems of installing and maintaining overhead circuits. For more information, ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

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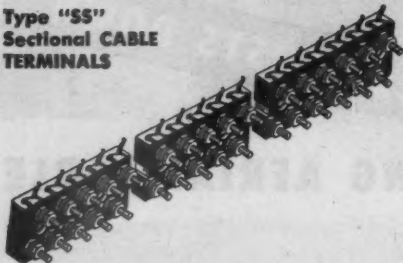


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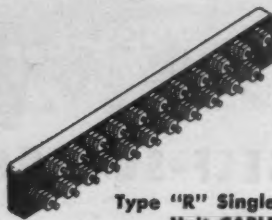
Of the thousands of electrical specialties and multi-contact electric connectors made by Cannon Electric, a few of the many specialties are shown below which are available through your wholesaler.

CABLE TERMINALS, SECTIONAL

Type "SS" Sectional CABLE TERMINALS

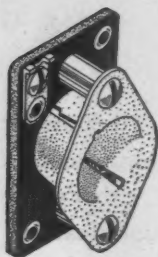


Type "R" Single Unit CABLE TERMINALS



Terminals are molded in phenolic insulation in a one-piece construction with no loose parts. Terminal posts are No. 8-32 cadmium plated brass screws with nuts and washers.

LAMP SOCKETS SHALLOW-MOUNTING



SHOWN are typical panel mountings. Lamp sockets are for use with single and double contact bayonet-type lamps. Available with single contact solder terminal, bridge for screw terminals and other combinations.



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Body alum. alloy,
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writers Approved.



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nector for 1/2" and
3/4" flexible con-
duit. Alum. alloy.
Underwriters Ap-
proved.



CR-1
Crimp-type con-
nector for thin
wall tubing with
locknut for 1/2"
EMT. Material,
zinc alloy.



FS-3 Fixture Stud
with 3/8" pipe
thread. Alum. al-
loy. With or with-
out locknuts. With-
stands standard
tests.

★ For a complete condensed general catalog of Cannon Electric products with list prices on the majority of items, write for the 32-page C-47 Catalog which will be sent free without obligation. Address Dept. D-231

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SINCE 1913

signed and constructed in the motor repair shop of the Lima Armature Works, Inc., Lima, Ohio. Here the only flame that contacts the stators is that of normal low temperature combustion of the winding insulation resulting from ignition by the high oven temperatures (800 to 900 degrees F. maximum).

Interior dimensions of the walk-in oven are: 6-ft. high, 5-ft. wide and 10-ft. deep. An insulated metal door (approx. 5-ft. by 3-ft.) slides vertically in channel iron grooves; is locked in open or closed position by four heavy clamp screws.

Two large natural gas burners fire the oven. Located on each side of the door at the base of the oven, they project their flame into long narrow gas chambers which extend the full length of the oven interior. Each chamber (one on each side of the oven at junction of wall and floor) is of brick construction; 16-in. high and about 12-in. wide; has numerous vent openings through which oven air passes over the gas flame. An exhaust vent at back of oven carries off combustion fumes. Although a natural draft is now employed, forced draft is being considered.

Motors are placed on a steel truck, then rolled into the oven. An angle-iron guide frame on the oven floor centers the truck between the two gas chambers. Normal burnout time for the average job is between two and two and one-half hours. Larger jobs may take longer. According to shop superintendent A. R. Mackey, operating costs run about 30 to 35 cents per hour. Reduction of stripping time and elimination of frame warping hazard are the greatest advantage.

Biggest economy experienced so far was the saving of about five days work on stripping a 500-hp., 1800 rpm. motor whose glass insulated windings were baked hard. Burnout time on this project was 3½ hours, Mackey reports.

Tool Rack Consists Of Hardwood Blocks

Users of small tools in motor shops will be interested in a new tool rack which is quickly installed, compact, adjustable and versatile. Manufactured under the name of the Wizard Toolrak, by the Davis Development Company of Colorado Springs, the rack consists of a variety of hardwood blocks which slide into a shaped aluminum back strip. In all, there are 31 different types of blocks which are variously drilled, counter-bored and slotted to hold most of the commonly used types

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RoFlex

ROME'S NEW NON-METALLIC SHEATHED CABLE

*Meets All Requirements
of the Man on the Job*

- EASY TO WORK • EASY TO STRIP
- LIGHT WEIGHT • SAVES TIME

Underwriters' Approved for 60° C operation under the '47 National Electrical Code.

Yes, RoFlex Non-Metallic Sheathed Cable, is easy to strip, light weight, uniformly small in diameter, and clean to handle . . . the kind of "flex" the electrician calls "easy to work." Further, step by step, it is constructed for low cost and trouble-free installation.

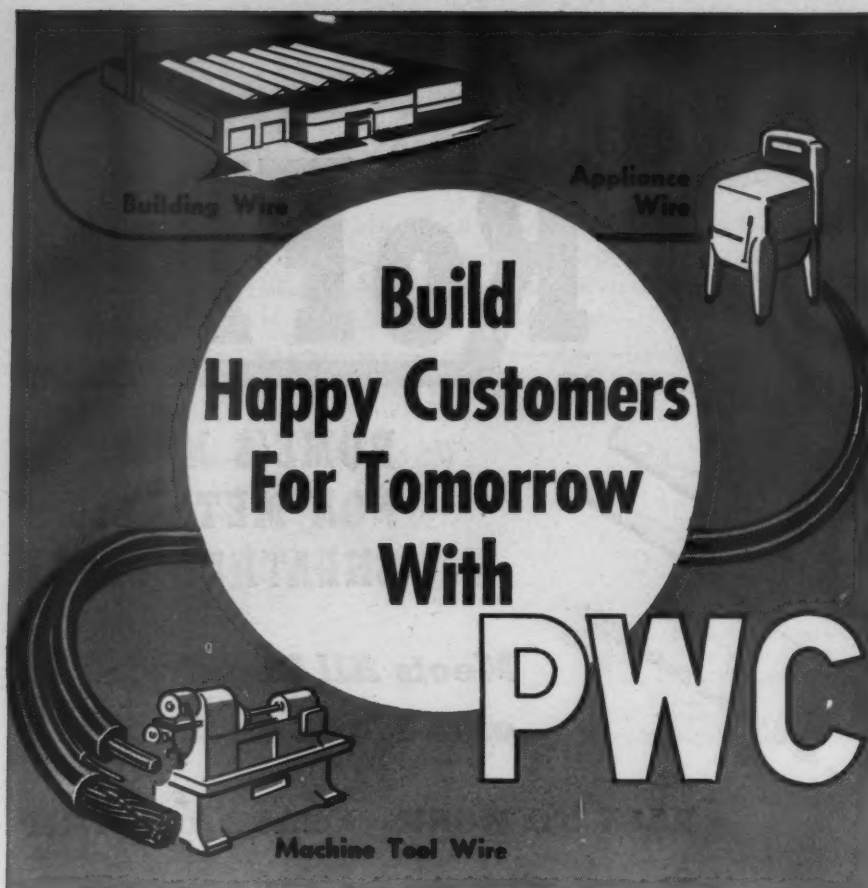
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1. The thermoplastic insulated conductors strip easily leaving bright, clean copper for quick connection. The insulation is highly resistant to oils, acids, moisture, flame . . . is permanently colored for quick and easy circuit identification.
 2. A spiral wrap of specially treated paper covering each conductor provides light-weight, durable protection against mechanical injury . . . yet, strips back easily.
 3. Impregnated jute fillers in each valley give the finished cable increased longitudinal strength, and serve as "rip-cord" for stripping outer braid.
 4. The outer cotton braid is flame and moisture resistant. The uniformly small diameter saves space in outlet boxes and fits smaller holes.
- Add them all up and you have a cable that is easy to handle and quick to install . . . the result is savings for you. Remember the name . . . RoFlex.

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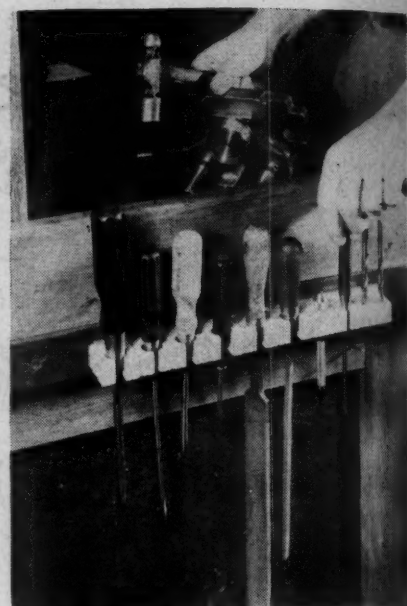
Other PWC properties speed work to save labor costs . . . for instance: ease of stripping, pulling through conduits and color coding (up to eight standard colors, others on special order). And smaller diameters permit more wires in a given conduit or space.

Write us your requirements so that we can talk PWC performance on these or other wires or cables in terms of your specific needs.

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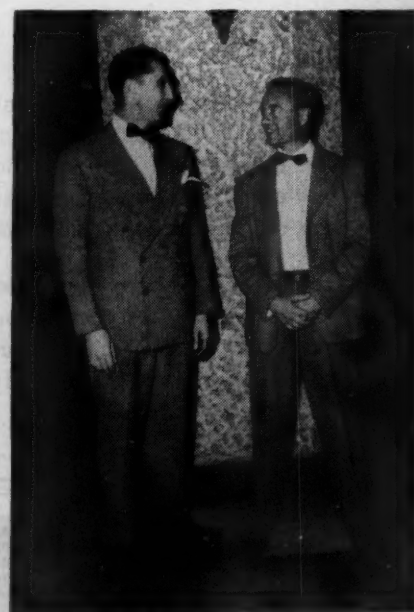
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Toolrak, consisting of a variety of quickly assembled hardwood blocks variously drilled, counter bored and slotted, is assembled on aluminum backing strip.

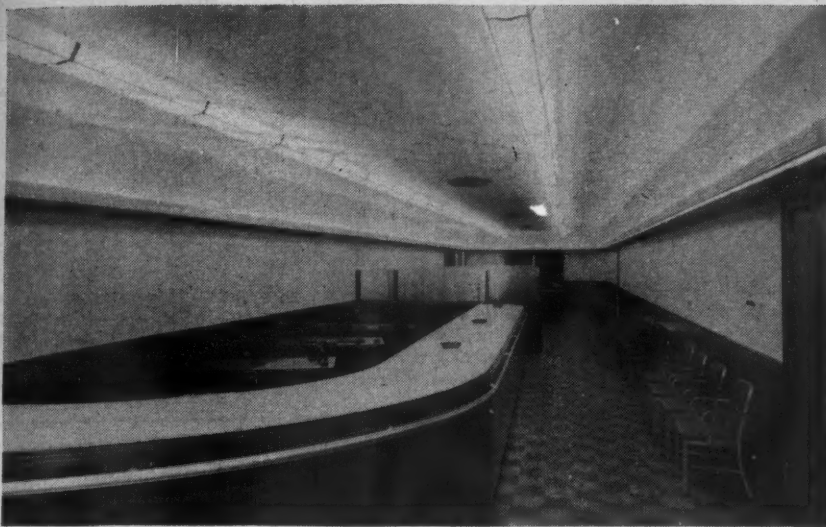
of tools on the market. The aluminum back strip comes in standard lengths from 8 to 36 inches. With the variety of blocks available, combinations can be made up to fit the individual needs of any shop and, since they are held in the aluminum strip only by friction, the blocks can be rearranged as local conditions or requirements warrant.

Tools are conveniently kept within reach of the worker and, with an individual slot for each tool, missing tools are instantly noted.



D. H. Jones, New York District Manager for Bulldog Electric Products Co. talks with General Meter Supt. Vaughn A. Cramer, Atlantic City Electric Co., during annual meeting of the Eastern Section, IAEI, held in Atlantic City, N. J.

Modern Lighting



Efficient direct lighting from ceiling surface-installed Moe-Bridges luminaires, supplemented with indirect cove lighting, provides 60 footcandles of glare-free eye-comfort lighting in the Consumer Credit Department of the Bank of Sheboygan, Sheboygan, Wisconsin.

Planned Lighting In A Bank

The Consumer Credit Department of the Bank of Sheboygan, in Sheboygan, Wis., is lighted to 60 footcandles with well-diffused, eye-comfort lighting. Both indirect cove lighting and ceiling-installed direct lighting contribute to produce the comfortable seeing conditions throughout the office area.

The office is approximately 16 feet wide, 90 feet long, and has a 12-foot high ceiling. A cove on the side walls and end of the office is located 30 inches below the ceiling. A continuous line of 40 watt lamps installed end to end is concealed within the cove, which reflects light to the ceiling and prevents an undue brightness-contrast between the ceiling and the surface-installed direct lighting luminaires. This indirect cove lighting also softens and tones down any shadows which might otherwise be produced by the ceiling units on the work plane below.

Two continuous rows of louver-shielded fluorescent luminaires, with 22 2/40-watt lamps in each row, provide the high intensity lighting throughout. These "Light-in-Line" fixtures, made by Moe-Bridges Corp., provide a high light output in the 0-45 degree zone by using a V-shaped reflector as a wiring channel cover, finished in an infrared baked enamel

white finish. Sides of units are Corning Alba-lite, a special composition, smooth surfaced translucent diffusing glass. Bottoms of units are metal louvers, transverse and cross, which provide shielding for lamps of 30 degrees along the length of the luminaires, and 5 degrees from either side of the units.

An important factor in this installation, contributing to the comfortable lighting result, is the use of the cove lighting. The ceiling-installed direct lighting units produce footcandle intensity efficiently. Use of the two rows of units only, however, would leave the ceiling relatively dark, even though some light is transmitted through the side glass panels, and also some light is reflected back to the ceiling from the floor, counter and desk tops. This reflected light only and small amount of side-transmitted light is not sufficient to illuminate the ceiling adequately to prevent undue contrast between the ceiling and the lighted units. By using the continuous cove around the perimeter of the room, the ceiling is lighted to an intensity and brightness which lowers the ratio of brightness between the ceiling and the luminaires so that the resultant appearance is pleasing and most comfortable.

Relighting Gives New Look

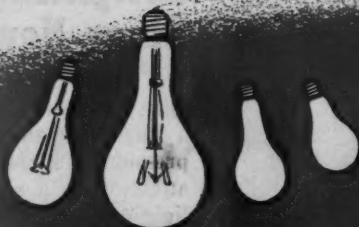
A small candy shop in New York City, the Barton Bonbonniere, achieved a startling transformation and an impression of increased size by devoting attention to a single item—a modern lighting installation. Two factors were considered by architect Morris Lapiques in selecting a completely louvred ceiling. First; the store measured a scant 8 by 15 feet and it was the object to create an impression of vastness without utilizing an obtrusive fixture. Second; since the merchandise was confectionery, the light was to be soft enough to establish an appealing atmosphere yet strong enough to display the products to the best advantage. In selecting a streamlined multiple louvred ceiling, manufactured by the Neo-Ray Products, Inc., both objectives were accomplished. Besides carrying the eye to the outer extremities of the ceiling and thus giving an impression of a larger area, the ceiling avoids brightness from direct lamp rays by utilizing a 42-degree angle of cutoff. Sections of the ceiling are individually hinged so that relamping is simplified and the baked white enamel factory assembly is sturdy and permanent.



A small candy store can achieve a sense of greater area by installing a multiple louvred ceiling similar to that installed in the Barton Bonbonniere Shop. Illumination is strong enough to dramatically present merchandise yet soft and even enough to create an appealing display of confections. Louvred sections are hinged for facility in maintenance, relamping and cleaning.

WESTINGHOUSE LAMPS

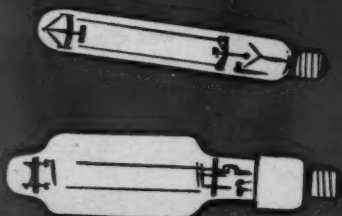
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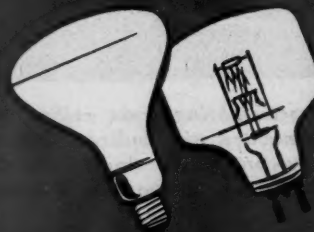
INCANDESCENT—Universally used for general lighting jobs. Westinghouse incandescent lamps are offered in sizes of 5 to 7500 watts with frosted, clear, or colored finishes.



FLUORESCENT—Westinghouse high-quality fluorescent lamps are available in all sizes from 6 to 100 watts in white, day light, soft white, and 4000 day white. Westinghouse slimline lamps are made in lengths from 42 to 96 inches. For more information, write for 24-page booklet, Form A-4759.



MERCURY VAPOR—Westinghouse, the foremost manufacturer of mercury vapor lamps, makes sizes of 100 to 3000 watts for general lighting, floodlighting, street lighting, photo chemical, photographic, and searchlight service. For more information, write for 24-page booklet, Form A-5112.



INFRARED—Available in sizes up to 1000 watts, Westinghouse infrared lamps are proving to be the simple, convenient, and economical source of heat for many baking, drying, and heating processes today. For more information, write for 16-page booklet, Form A-3817.



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STERILAMPS®—Sterilamps, the Westinghouse germicidal lamps, are available with ratings from 4 to 30 watts. Only Westinghouse also offers the new slimline germicidal Sterilamp with new high intensity that cuts cost of protection in half.

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The lamps you use are the key to the effectiveness and efficiency of your lighting system. When you use Westinghouse lamps you are assured of having the best lamps that modern engineering, manufacturing, and production methods can produce.

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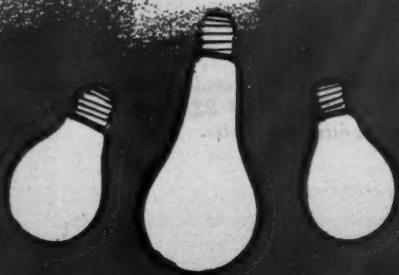
Uniform performance

Lamps made to close dimensional standards

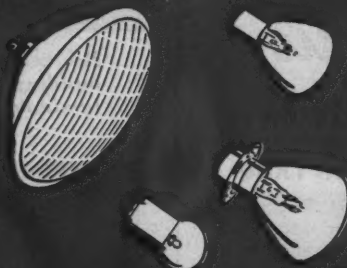
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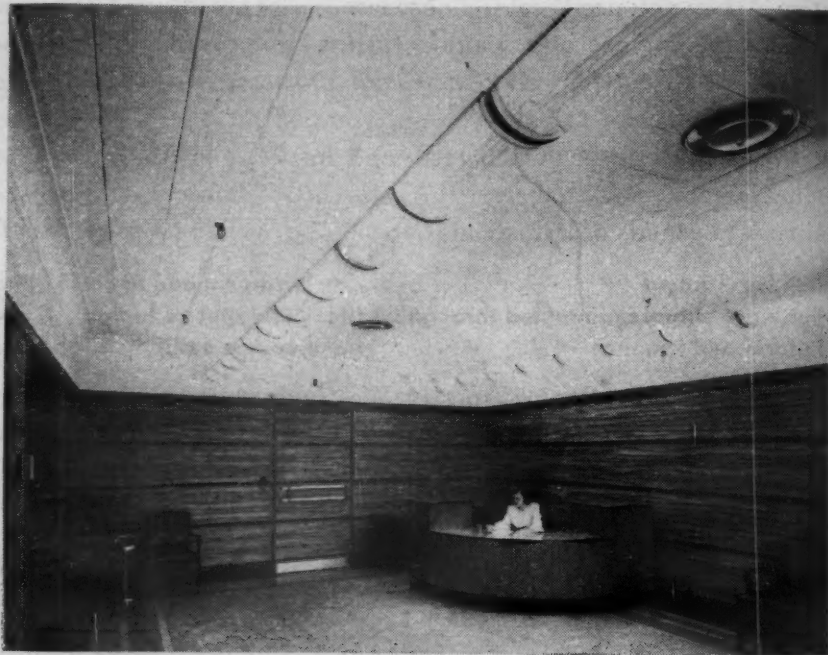
BUILDERS OF ELECTRICAL
EQUIPMENT SINCE 1905

Offices Lighted with Luminous Indirects

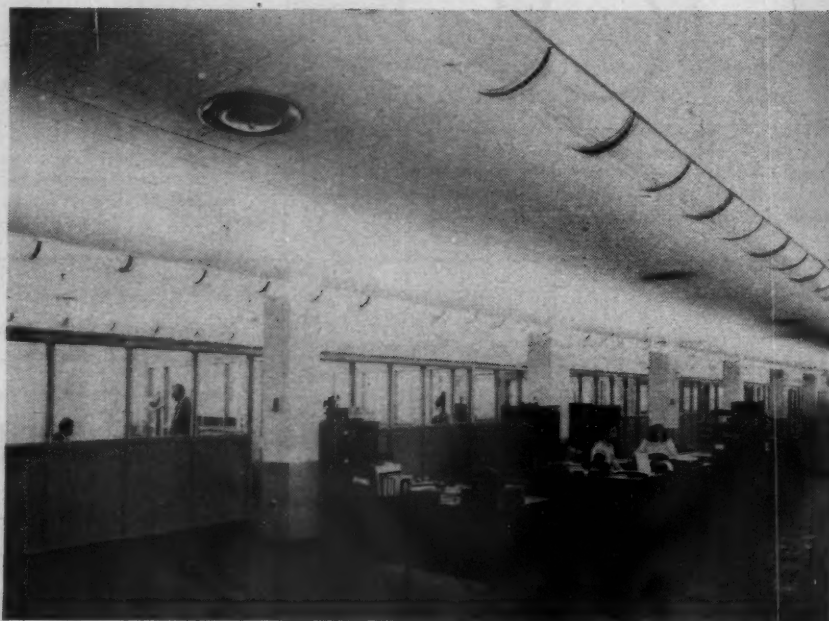
The entire fifth floor addition of the General Tire and Rubber Company, Akron, Ohio, is lighted with the Wakefield "Star", a luminous indirect lighting unit. Recently completed, this floor covers approximately 31,000 square feet of floor area. Included in the floor area are general sales offices, private offices, a reception lobby, corridors and an auditorium. The suspended luminous indirect fluorescent units are used throughout. Except for corridors, intensities vary generally between 26 and 40 footcandles.

The reception room is 18 ft. 6 in. wide by 27 ft. long. Two rows of units, each 24 feet long, are spaced nine feet apart in this area. The ceiling is white acoustical tile, and side-walls are gumwood veneer with 25 percent reflection factor. Average intensity is 32 footcandles, indicating a coefficient of utilization in this room of approximately 29 percent.

The auditorium is 30 ft. 6 in. wide by 61 ft. long, with six beams running across the room on 10-foot centers. Six rows of continuous lighting units, each



Reception room on fifth floor of General Tire and Rubber Company building, Akron, Ohio, has average intensity of 32 footcandles from luminous indirect fluorescent continuous row units.



Eight continuous rows of Wakefield "Star" units, each 180 feet long, light this large general office area. Rows run parallel to window walls.

Family Portrait



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WOODSIDE, NEW YORK

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Easy TO INSTALL



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Weatherproof installations no longer need be of the old-fashioned "one-to-a-gang" type. With P&S Weatherproof wiring devices, you can have the added convenience of an extra switch or an extra outlet with a switch—under a one-gang plate.

T-rated switches—Outlets with double grip contacts—Each device sealed with cover and plate gaskets—.060" brass plates with aluminum finish not affected by atmospheric conditions.

P&S Quality based on over 50 years' experience in the manufacture of wiring devices—your assurance of a trouble-free wiring job. Consult P&S Catalog No. 42 for complete information.



PASS & SEYMOUR, INC.
SYRACUSE 9, N. Y.



Auditorium in General Tire and Rubber Company's office building uses continuous rows installed parallel to beams, located on ten-foot centers. Intensity is 26 footcandles.

28 feet long and containing seven 2/40 watt units are suspended at midpoint between the beams. The ceiling in the auditorium is white acoustical tile, and the upper side walls are buff with 59 percent reflection factor, while the lower sidewalls, from dado to floor, are green with 28 percent reflection factor. The lighting intensity is 26 footcandles, and the lighting load is 2.26 watts per square foot.

Individual 4-foot 2/40 watt units are spaced 13 feet on centers in all corridors, with the long axis of the units parallel with the length of the corridor. This provides ample illumination for lighting passageways.

Private offices throughout are lighted with two continuous rows of units, installed normal to the window walls. These offices vary in width and length, but none are narrower than ten feet, or wider than 18 feet. More individual four-foot units are added to the continuous rows when offices are long enough to warrant. With white acoustical tile ceilings and 60 percent reflection cream side walls, intensities range between 30 and 38 footcandles in all private offices.

Columns divide general office areas into 20 ft. by 20 ft. bays. Continuous rows of the luminous indirect units are spaced on ten-foot centers in these areas, and run parallel to window walls. The ceiling is white acoustical tile throughout all areas. Side walls in general offices are light green with 54 percent reflection on upper walls, and dark green with 29 percent reflection on lower walls. Illumination averages 40 footcandles in large open areas, and 32 footcandles in individual offices formed by eight foot high steel and glass partitions.

C. J. Collins, plant engineer for

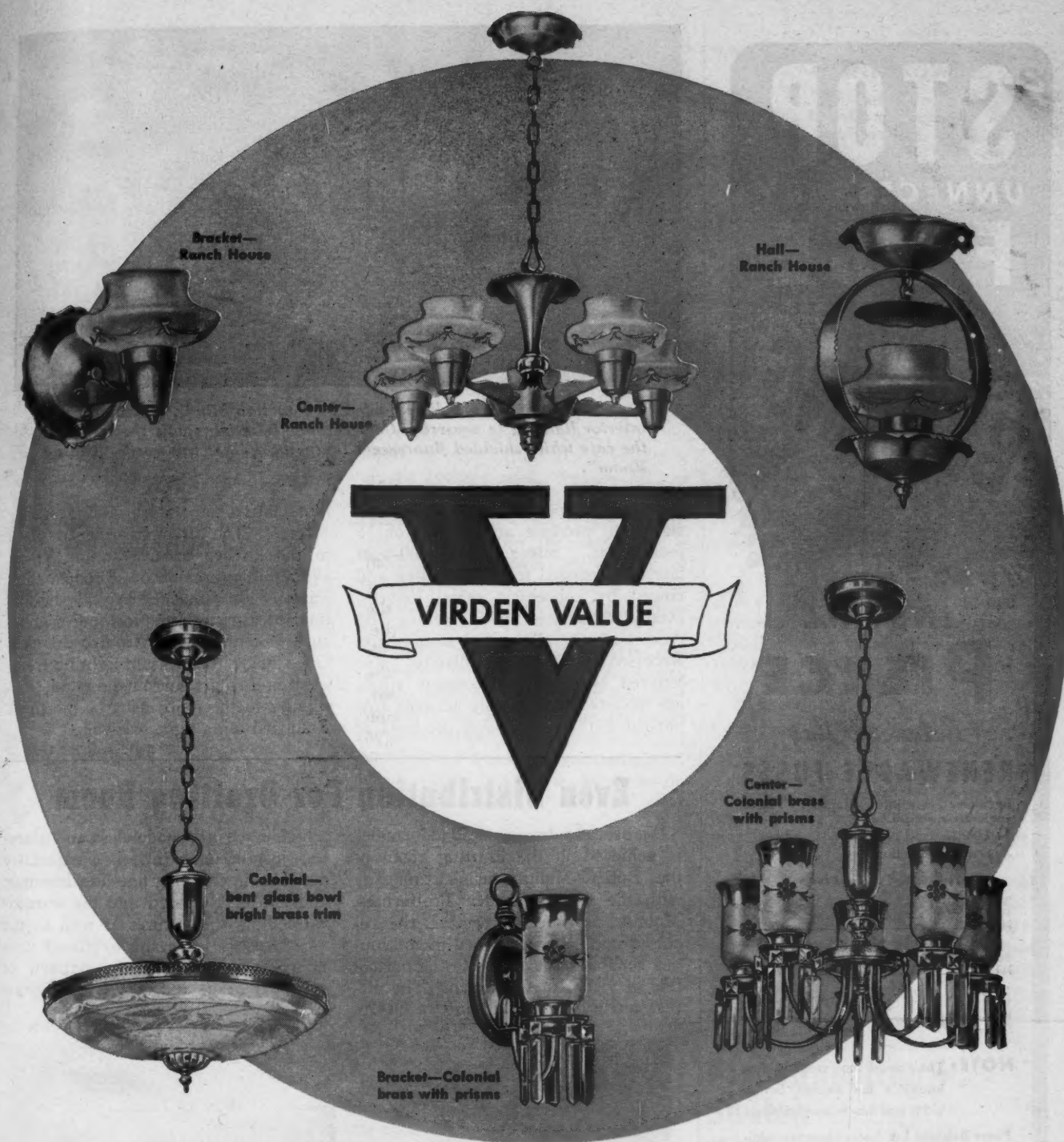
General Tire and Rubber Company, selected the Wakefield "Star" unit for this installation because of its neat appearance and good maintenance features. He made the lighting layout in collaboration with Wakefield engineers.

Lighting Planned For Dining

Planned lighting, combined with tasteful decorations and an acoustical ceiling treatment, makes Chadwick's Dining Room a pleasant rendezvous in San Diego, California. In the dining



Dining room of Chadwick's cafe in San Diego is illuminated by silver bowl indirect fixtures, suspended and louvred, and recessed direct flood lamps, also louvred. Average lighting intensity is 15 footcandles in this area. Direct units, mounted in kitchen, produce 20-footcandle average intensity.



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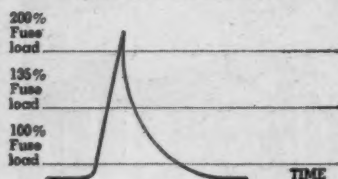
BLOWING

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Typical High overload surge



NOTE: The elapsed time at 200% fuse load is a few seconds, but at 135% load may be many minutes.

Pierce Balanced Lag fuses concentrate additional lag in the safe overload range, from 100% to 200% load, where lag is needed to prevent unnecessary fuse blows.

FREE: Balanced Lag Link to inspect and test. Specify amperage, voltage.



Large glass areas, partially shielded by Venetian blinds, indicate bright interior lighting to passerby. Cold cathode lettering spells the name of the cafe while shielded fluorescent lamps back-light the words "Dining Room".

room, two types of fixtures are installed to produce an average of 15 footcandles. Silver bowl 500-watt lamps, suspended from the ceiling and ringed by concentric metal louvres, evenly illuminates the tile ceiling and creates an overall, restful atmosphere. Recessed 200-watt floodlamps, also louvred by smaller concentric rings, are mounted strategically between suspended fixtures and raise the level of

illumination on tables and working surfaces. The direct treatment is used in the kitchen area, resulting in an average illumination of 20 footcandles. Patrons admit that the brightly-lighted interior attracts attention and encourages first-timers to patronize the cafe. Once inside, the pleasant lighting treatment and smart surroundings add materially to the enjoyment of the meal. Standard units light sidewalk.

Even Distribution For Drafting Room

An overall intensity of 50 footcandles is achieved in the drafting room of the Butler Manufacturing Company with the use of Leader Trofferlites. Mounted on six-foot centers, the recessed units are positioned in continuous runs at right angles to the normal line of vision of draftsmen. The diffuse quality of the lighting results in

a high-intensity, shadowless and glareless installation which is particularly desirable in checking fine-line drawings and notes. Recessed into the acoustical ceiling, the fixtures as well as the air diffusers leave the overhead area unbroken except for the pattern of sprinkler heads and creates an impression of vastness.



Drafting room illumination is even 50 footcandles with continuous runs of Leader Trofferlites spaced on 6-foot centers and mounted at right angles to the draftsmen's normal line of vision.

Questions on the Code

Space Requirement

Q. In Section 3737b if a switch had one tap to another motor used on same machine, would that be a violation of this Section? Switch box has ample room and no other conductors going through.—W.J.S.

A. If there is adequate space for this purpose provided in the box, there would be no violation. The last part of 3737b covers this.—F.N.M.S.

Conductors

Q. Can one pull the start and stop wires from motor control button switches through the conduit containing the motor supply wires.—J.G.

A. Yes, control, relay and ammeter conductors used in connection with any motor or starter may occupy the same enclosure as the motor circuit conductors. This ruling will be found in the last sentence of Section 3011 of the Code.—G.R.

Farm Wiring

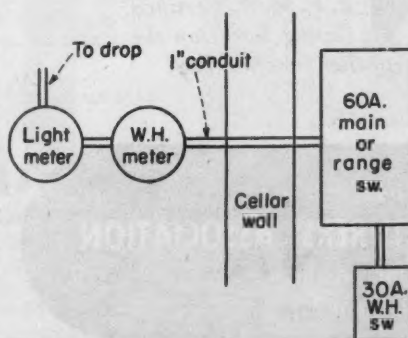
Q. We have used quite a lot of underground cable for feeders and service wires on farms and it has been our practice to bring these cables up the yard pole and into the distribution cabinet. We have fastened them to the yard pole in the past with straps, but the new inspector demands that we bring them up the pole in conduit or wood moulding? Is that required by the Code?—A.N.S.

A. Type U.S.E. cable is produced in several different types of construction, some is armored and in recent years we have seen the develop-

ment of a new type single and two wire cable with an outside neoprene or similar compound jacket. These newer conductors would be susceptible to injury wherever exposed to traffic, such as might be expected about the yard pole on the average farm. Section 2312 of the Code requires that underground cables be protected to a height of eight feet when run up the outside of a building or pole unless the cable is of the armored type. Inasmuch as the difference in cost between the armored and unarmored Type U.S.E. cable is considerable, the percentage of armored cable used on farm wiring jobs is very small. Evidently your new inspector has yet to find an installation on which the armored cable was used, so he felt justified in requiring protection for all U.S.E. cables brought up the poles on his project.—G.R.

Service Switches

Q. We have had considerable discussion about the use of socket meters in conjunction with water heaters which are metered separately in our locality. We wired, as shown below, but our inspector thinks it is very confusing to anyone trying to locate the main switch. The Utility Company can offer no solution as yet. As it is, the customer would have to disconnect both the switches to disconnect the building and we believe the average customer would assume the building is dead when the large



switch is disconnected. Is there a more practical way of doing this within the Code?

A. We ran two No. 10 RU conductors in the same 1 inch conduit with two No. 6 and one bare No. 6 conductor. We believe we are right in using RU or T conductors in the same conduits as long as we don't go over 40 percent of conduit fill. Is this correct?—M.W.M.

A. It is permissible under Section 2351, to install up to six service switches in a building. This naturally would require more than one single operation to disconnect the current from the entire building.

There would be no violation of having two service-switches as indicated above.

The solution of the problem would be to plainly mark the switches to show what they control; that is, to mark one "Main Service and Range" and the other "Water Heater only".

It is permissible to run Types R, RW, RU, T and TW in the same conduit as they have the same temperature limitation (60 percent C) and therefore their carrying capacities would not be affected.—F.N.M.S.

Disconnecting Switch

Q. Will the Code permit the use of a single disconnecting switch for a group of three phase 230 volt motors varying from ½ hp. to 2 hp. if each motor has its own controller?—B.K.W.

A. Section 4410 of the N. E. Code contains the answer to your question. This section reads as follows: "Each motor shall be provided with individual disconnecting means, except that for motors of 600 volts or less a single disconnecting means may serve a group of motors under any one of the following conditions. The disconnecting means serving a group of motors shall have a rating not less than is required by Section 4402 for a single mo-

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● In years past, concern was often expressed about the uncertainty in the performance of propeller fans in all types of usage. Standard propeller fans would occasionally fall short of expectations...even a fan manufactured for special use might not operate the way it should, according to the specifications set up for it.

The Propeller Fan Manufacturers' Association was aware of this situation. As a result, several years ago the Association adopted the recognized test code of the American Society of Heating and Ventilating Engineers as its own standard of testing for "Certified Ratings."

Thus an assurance of performance of propeller fans in accordance with specifications was made possible.

Today seventeen of the leading manufacturers of propeller fans are members of the Propeller Fan Manufacturers' Association, testing and rating their fans according to the standard test code established by the American Society of Heating and Ventilating Engineers. This gives you ample opportunity to select a certified propeller fan on your next purchase.

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Detroit 2, Michigan

tor whose rating equals the sum of the horsepowers or currents of all the motors of the group.

(a) If a number of motors drive several parts of a single machine or piece of apparatus such as metal and wood-working machines, cranes, and hoists.

(b) If a group of motors is under protection of one set of overcurrent devices as permitted by paragraph (a) of Section 4343.

(c) If a group of motors is in a single room within sight from the location of the disconnecting means."—C.R.

Dust Condition

Q. We have been given a job to wire a new feed mill being installed in the cellar of an old flour mill.

These two mills will be separated by a dust-tight floor and the switchboard will be installed in a dust-tight room.

Would it be necessary to use explosion-proof switches and fittings and equipment?—F.R.K.

A. The electrical equipment which is not in a dusty location would not have to be of the dust-tight type. Such equipment has to be used only when it operates in a hazardous atmosphere.—F.N.M.S.

Wiring A Whiskey Plant

Q. We have been offered the job of wiring a small whiskey blending plant and are undetermined about the type of electrical equipment which the Code will require. The use of an explosion meter in a similar plant failed to indicate that an explosive condition existed and the wiring in that plant is ordinary and has been in use since the prohibition law was repealed. Naturally the owners of this new plant will prefer the installation of ordinary electrical materials due to the great difference in cost. We, however, must comply with the Code, so will you please tell us whether or not the Code will require explosion-proof equipment?—N.L.B.

A. The use of an explosion meter or vapor analyzer of the direct reading type often creates a sense of false security as it only indicates the concentration of vapors at any given time. There need be only an explosive mixture present for a fraction of a second to destroy the plant, so actually the use of such a meter cannot be depended upon to determine if explosion-proof electrical equipment is required.



EXPLOSION-PROOF

PYLETS

... for Hazardous Locations

EXPLOSION-PROOF SWITCH PYLETS

1. TUMBLER SWITCHES with push-pull Rod to control motors or lighting circuits in hazardous locations. 1 and 2 gang, 1, 2 and 3-pole, 10 to 30 ampere, also 3 way and 4 way, 10 and 20 ampere types.

2. TUMBLER SWITCHES with interlocking Plug Receptacle for use as service outlets for portable electrical equipment in hazardous locations. Plugs cannot be inserted or withdrawn unless switch is open. Switch cannot be closed unless plug is fully inserted. 2 and 3-pole, 20 and 30 ampere, 250 and 460 volt ratings.

3. EXPLOSION-PROOF SECONDARY CIRCUIT BREAKER PYLETS for protection of motors against overloads and stalled rotor currents. Can also be used for "on" and "off" switch. Single and double pole with a selection of interchangeable heater units for protecting fractional horsepower motors.

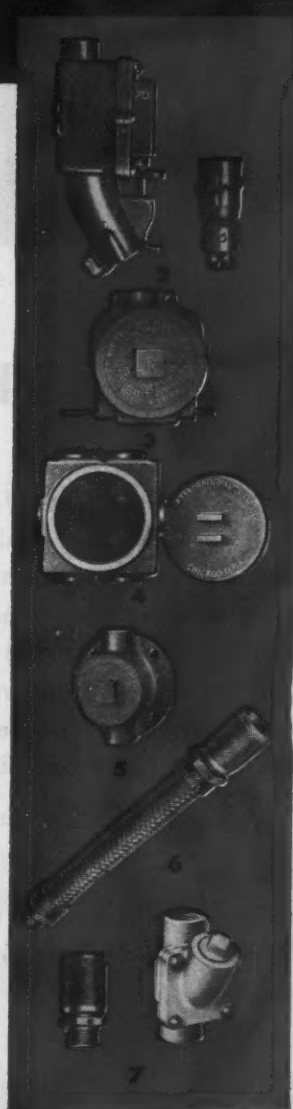
4. EXPLOSION-PROOF UNIVERSAL JUNCTION PYLETS—6, 7 and 10 hub types with close-up plugs. For easy replacement of sheet metal knockout boxes in the re-wiring of old gasoline pump installations.

5. EXPLOSION-PROOF JUNCTION PYLETS available in a wide selection of styles and sizes with threaded or union type hub. Furnished with plain covers for general use or with covers tapped for conduit to support lighting fixtures. Also furnished with pipe plug angle type cover for filling with sealing cement.

6. PYLE-O-FLEX flexible explosion-proof and watertight fittings for adjustable and vibrative connections to motors, floodlights and pendant type lighting fixtures. Furnished in any combination of male and female threaded or female union type end connections with flexible lengths of 4 to 36 inches, conduit sizes 1/2" to 2" inclusive.

7. EXPLOSION-PROOF SEALING PYLETS have removable pipe plug covers which can be mounted in any one of four positions for filling with cement. Used to isolate the wiring compartments of arc-producing devices from balance of conduit system.

EXPLOSION-PROOF UNIONS, male and female, straight and 90° elbow types.



A line of the most commonly used types of conduit fittings for hazardous locations as defined in Article 500 of The National Electrical Code. Explosion-proof Pylets are designed in accordance with Underwriters' Laboratories requirements and are classified in their list of inspected electrical appliances. Their substantial construction and the high quality of materials and workmanship insure safety, uninterrupted service and long life. Consult your Pylet Catalog 1100 for complete listings of the above and other Explosion-Proof and Dust-Tight Pylets.

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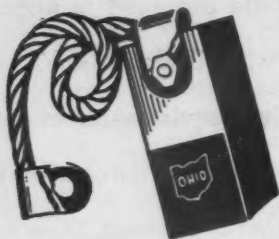
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ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1948





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In any process involving the use of hazardous liquids, such as ethyl alcohol, where the liquid is not contained within sealed tanks and piping, we must assume that it is possible for an explosive mixture to form as long as the ambient temperature of the room is above the flash point of the hazardous liquid involved. Ethyl alcohol by itself has a flash point of approximately 50 degrees F. Most whiskies contain from 40 to 50 percent ethyl alcohol and such mixture will have a flash point of about 75 degrees F. Inasmuch as it is unlikely that the ambient temperature can be kept below such a point, the Code would require the use of Class 1 Group D equipment.—G.R.

Co-occupied Conduit

Q. Code Section 320 seems to indicate that it is permissible to enclose both power and control leads for a 440 volt motor in the same conduit. However, we get continued rebuttal that this is not according to Code nor is it general practice. We will appreciate any information you can give us on this point.—C.W.M.

A. The last sentence of Section 3011 covers this question quite clearly. This states that: "Control, relay and ammeter conductors used in connection with any motor or starter may occupy the same enclosure as the motor circuit conductors".

It is quite general practice to run the control wires in the same conduit with the power supply conductors.—F.N.M.S.

Lightning Ground Conductor

Q. Can we run a lightning ground through a conduit? We have been asked to provide a lightning ground for a flag pole mounted on the roof of a masonry building in the middle of a row of buildings. The owners do not want the grounding cable or conduit brought down the front of the building because of appearance and it is too far to the rear, so we want to run a grounding wire straight down through the building and bond it to the water service pipe.—E.M.L.

A. The lightning grounding conductor may be run through a conduit providing it is bonded to the conduit at both ends of the conduit run. This conduit run must be as short as possible and as straight as is practical avoiding all sharp bends. See Section 2823 of the N. E. Code. Then,

CERTIFIED BALLASTS are your protection, too!



You safeguard your reputation when your fixtures are equipped with Certified Ballasts.

Fixtures with Certified Ballasts assure you and your customers of these advantages . . .

- Rated light output
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Certified Ballasts are used in all Fleur-O-Lier fixtures, in RLM Certified Equipment and in Certified Lamps with circline tubes.



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CIRCUIT BREAKING PLUGS RECEPTACLES - - - CABLE CONNECTORS

RATINGS
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30 TO 400
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Heavy Duty Industrial
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ENGINEERED AND PRECISION BUILT—

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SAFE OPERATION

Positive grounding by means of housing and separate contact for safety circuit wire.

Polarized by means of contact arrangement and groove and key in housing. Impossible to insert plug incorrectly.

All contact surfaces are precision machined and adjusted for maximum contact pressure, reducing arcing to a minimum.

Arcing chamber is completely inclosed. Arc is extinguished before plug is completely removed.

FOR

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Contacts—free floating, self-wiping, stay clean and retain full contact pressure.

Sealed cable grip — no strain on connections. Excludes all dust and moisture.

Ground surfaces and durable oil-resistant gaskets.

Liberal space for wiring, quick and easy access. Facilitates inspection and servicing.

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Substantial external lugs for easy mounting.

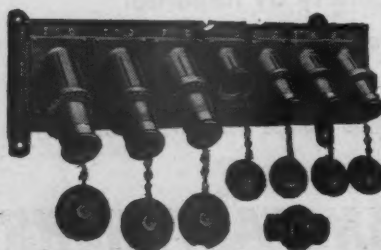
Boxes will accommodate a variety of conduit outlets to suit all job requirements.

Ample wiring space and substantial terminals make wiring easy.

Assembly of interior and contacts requires no special tools.

Interiors do not extend back of covers permits direct assembly to cabinets without internal interference.

A high degree of standardization and interchangeability of parts provides a wide variety of types and sizes to suit every requirement.



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under Section 2534, you will note that wherever metal enclosures of other conductors cannot be kept at least six feet away from the lightning conductor they shall be bonded together. Section 2826 will give you permission to ground to the water service pipe. It is assumed that this flag pole is attached to a masonry building that does not have a grounded steel frame and that the pole is supported on nonconducting material.—G.R.

Six Service Switches

Q. Section 2351a limits six sets of service entrance equipment to one set of service entrance conductors. Why was the number set at six and not four or eight or ten or any other number?—C.W.C.

A. The number of six for the limitation of the sets of service equipment in a building was arrived at by the "cut and try" method.

Originally the limitation was for one and only one service switch and cutout to serve a building. Then it was decided that it would not take a very much longer time to open four service switches than it did to open one so the limitation was set at that number (4). Then later it was argued that it would not take very much longer to open six switches and the limitation was set at six. It was a consideration of the time element only.—F.N.M.S.

Snap Switches

Q. Our inspector has just advised me that we must use snap switches having twice the load rating on all fluorescent lamp installations. We are now planning a good sized lighting installation and the use of switches having twice the ampere rating of the load controlled will add quite a bit to the cost. Does the Code require such switches?—E.M.K.

A. Yes, if you will refer to Section 3814-c you will find that a snap switch controlling inductive loads shall have an ampere rating twice the ampere rating of the load unless they are of a type approved as part of an approved assembly or for the purpose employed. This will definitely require the ordinary snap switch controlling one or more fluorescent lighting fixtures to have twice the ampere rating of the combined rating of the tubes and ballast used.—G.R.



RUSSELL & STOLL COMPANY, INC.
Precision-Built Electrical Equipment
125 BARCLAY STREET, NEW YORK 7, N. Y.

In the News

McGraw Award to Earl O. Shreve

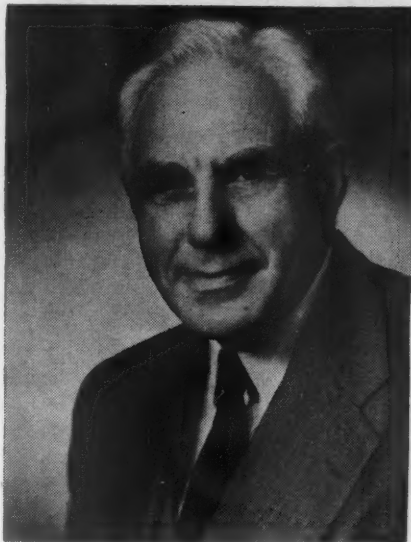
Earl O. Shreve, vice president of the General Electric Company, received the James H. McGraw Award Manufacturers Medal for 1947. Presentation was made by W. T. Stuart, editor of *Electrical Construction and Maintenance* and secretary of the Committee of Awards, at a luncheon held in Chicago on March 17th, during the winter convention of the National Electrical Manufacturers Association.

The citation, accompanying the award, reads as follows:

"Along the path toward achievement men are driven by many conflicting forces. As powerful personal aims are diffused through mature thought and wise judgment toward industry goals, a man assumes greater responsibility. His counsel is sought. His words carry conviction. He leads. But the mantle of leadership brings with it the burden of resolving conflicts not only within himself, but also for those who look to him for wise and able guidance. For many years Earl O. Shreve, vice president of the General Electric Company, has brought to the councils of the National Electrical Manufacturers Association a quality of confident statesmanship, of wise leadership, of unswerving loyalty and of tireless energy beyond measure or appraisal. His stewardship has encompassed the industry as a whole. His service has been constantly inspired with the conviction that what was best for the electrical manufacturing industry would, in the end, be best for every company, large or small, in the industry.

The capacity for courage which swept aside selfish interest and narrow viewpoint won for him the confident support of his company associates. Representing the largest single manufacturer in the electrical industry, he brought to association activities the compelling interests of one company. Yet his views, actions and decisions were consistently and clearly industry-wide. In resolving widely conflicting interests he always sought not compromise, but greater goals.

To the National Electrical Manufacturers Association, he has given an unsurpassed record of devotion and hard work. For fourteen years he has served as a member of the Board of Governors, of the Budget Committee, of the Law Committee, of the Regulatory and Legislation Committee, of the Executive Committee. He has served as a member or as chairman of almost every important committee activity. He served four terms as vice



EARL O. SHREVE

president. He served as president from 1940 to 1941.

For these contributions to the improvement and progress of the electrical manufacturing industry, made at the expense of great personal time and effort, the Committee of Awards, on the recommendation of the judges, has voted to Mr. Shreve the 1947 Electrical Manufacturers Medal and Purse given under the James H. McGraw Award.

The panel of judges who recommended Mr. Shreve for this honor consisted of F. C. Jones, The Okonite Company; Leonard Kebler, Ward Leonard Electric Company; D. Hayes Murphy, The Wiremold Company; George C. Thomas, Jr., Thomas and Betts Company, Inc. and W. T. Stuart, the Committee of Awards.

NECA Announces Lighting Guarantees

A program in which the electrical contractor guarantees the lighting installation in homes, commercial establishments and factories for one year was announced at the opening of the Tri-State Planned Lighting Exposition and Conferences, held in Pittsburgh, Pa. March 1-4, 1948.

The lighting guarantee plan was proposed by members of the National Electrical Contractors Association, many of whom already issue written guarantees on satisfactory performance of other types of electrical installations.

At present, lighting equipment is exempted from the NECA guarantee.

Addressing the Contractor's Conference at the Exposition, which was sponsored by the Electric League of Western Pennsylvania, Paul M. Geary, executive vice president of NECA, said:

"I take this occasion to announce that starting June 1 it is the intention of NECA to recommend to its Chapters the removal of the lighting equipment exemption in the NECA Guaranteed Certificate Program".

This move marks an important development in the lighting market. Mr. Geary pointed out that good lighting was one of America's secret production weapons and that immediately after the war ended there was a rush to demand and install lighting. The premium was on fluorescent lighting.

"This was the era of worship of the footcandle", Mr. Geary said. "Anything to get illumination levels up and up. You know what happened.

"A lot of this super lighting went into places that did not have a wiring system adequate to sustain the load. There was hell to pay on that score. A lot of equipment went in that was sub-standard and poorly engineered. The results were devastating to customer relations. And what is even worse—perfectly good equipment went in on adequately-wired systems but went in poorly laid out and designed".

The industry—the manufacturers, distributors, contractors and utilities—are aware of this condition and have set about to rectify these unfortunate lighting applications. The first step was to instill in the industry's thinking that good modern lighting must be planned first; then engineered and installed properly. It is not a job for the handyman and Mr. Geary explained:

"Lighting is a complex product dependent upon many factors such as electrical adequacy, design, environmental considerations such as paint, quality of equipment and competence of installation.

"It certainly cannot be supplied by the fixture peddler, the catalog salesman or the curbstoner who doesn't know a lumen from a locknut".

It is essential, too, that the public understands this.

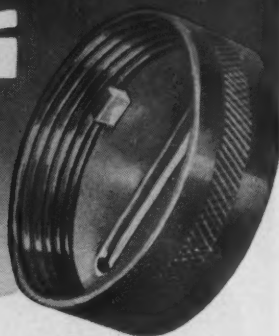
The second step is in the category of that proposed by NECA: the guarantee of lighting equipment. Mr. Geary

New POSITIVE LOCK Construction of Monarch Renewable Fuses

Assures →
TRUE ALIGNMENT

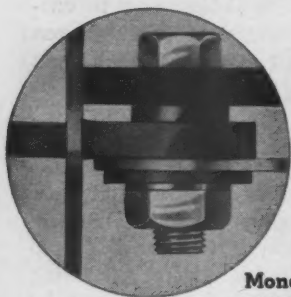
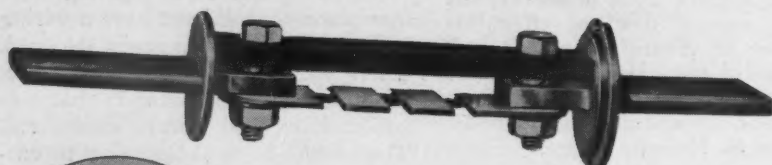


The brass lugs inside the caps used on Monarch Fuses (see illustration at right above) fit into equally spaced slots in the brass casing inserts. This new and improved Monarch construction assures true alignment of the copper holding terminals . . . and establishes a positive lock on both ends of the fuse.



and for

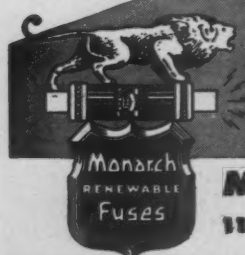
STILL GREATER PROTECTION . . .



MONARCH'S Compressed Tension Lock Washer construction (illustrated at left) compensates for contraction and expansion of the fibre bar by exerting constant tension on the bar . . . and assures no loose parts. The washer also separates the fibre bar from the copper terminals . . . a spacer to provide better cooling.

Monarch Fuses are fully approved and are available through recognized wholesalers.

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FUSErvice

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N. Y.

pointed out that it might not be possible for a customer to get immediately a guarantee in every instance. For the contractor to issue a guarantee he naturally must provide all materials and make sure that they come from suppliers who will stand back of their products. The same consideration applies to the manufacturer in his dealings with component suppliers.

However, discussions over the past several months indicate that the quality of lighting equipment, in general, today is very high and is improving. Most suppliers are not only willing but eager to stand back of their product.

RECA Raps Co-Op Methods

Sharp criticism of rural electric co-operatives' methods of handling line construction contracts was made at the third annual convention of the Rural Electrical Contractors Association held Feb. 9-11 at the Edgewater Beach Hotel, Chicago. Incompetent engineering and material take-off by co-op engineers, poor business tactics, constant bid rejection and re-bidding of projects, delayed payments on work estimates and completed projects (up to six months or more) were specific charges leveled by the contractors. This has led many contractors to bypass REA work "until such time as the work will be handled in a business-like manner", open forum discussion revealed.

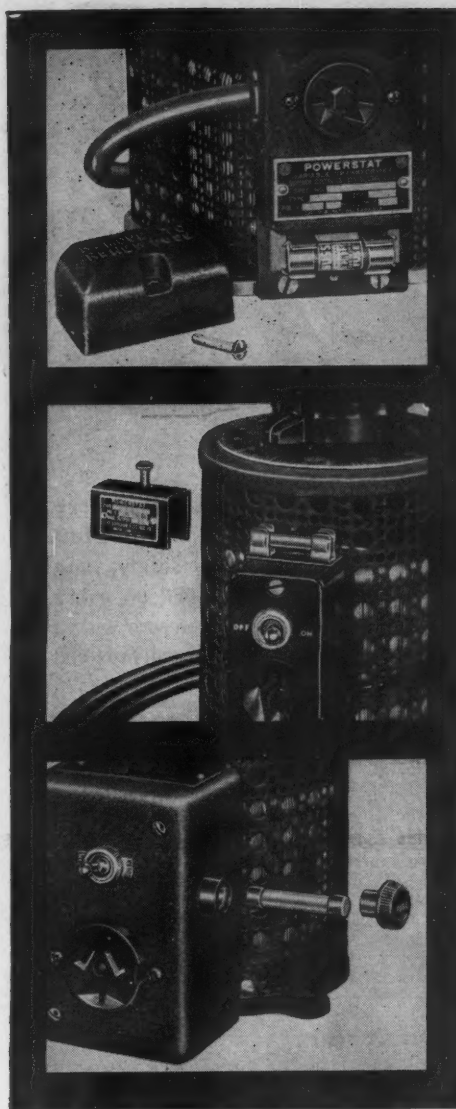
Contractors are refusing to bid on projects since they have no assurance that the contract will be awarded to the low bidder; are reluctant to rebid jobs on which they originally gave their best price; are tired of becoming bankers by having large investments tied up by slow payments. While the contractor must live up to his construction contract, many co-ops are not abiding by the terms of their engineering and loan contracts which call for competent engineering and prompt invoice payments, Association members complained.

RECA was generous in its praise of REA's engineering and financial divisions in Washington for clear cut specifications and prompt clearance of payment requests. The bottleneck appears to be at the co-op level. Chances of more REA pressure on co-ops are slim in the light of recent Congressional charges of too much REA dictation and the cut in REA administrative funds, declared REA administrator Claude Wickard. Understaffed and unable to get competent help at the imposed salary ceilings, REA is doing more work than ever, he revealed. Be-

VARIABLE VOLTAGE

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POSITIVE PROTECTION



A POWERSTAT is the only variable transformer of comparable design that offers a fuse in the output circuit for user and instrument protection. This fuse is conveniently located on the terminal board of POWERSTATS of one and two KVA ratings and provides insurance against large loads or shorts ruining expensive equipment or burning out the POWERSTAT. This is only one of many features that makes POWERSTAT variable transformers the most desirable equipment where dependable, continuously adjustable a-c voltage is required.

POWERSTAT variable transformers are rugged, quality manufactured controls that can be adapted easily to fit any and all variable voltage a-c requirements . . . offering over 50 possible combinations of connections and voltages for single or three phase operation and featuring:

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- ZERO WAVEFORM DISTORTION
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Rely on the experience of The Superior Electric Company's staff of voltage control engineers to help solve your voltage control problems.

An engineering data catalog, Bulletin 547, is available on request.

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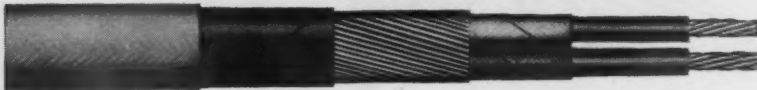


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WIRE & CABLES

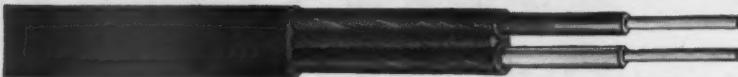


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Start the job right with COLLYER Service Entrance Cable! Type SE, Style U, unarmored, with concentrically wound bare neutral, is tamper proof and eliminates conduit. Its gray, weatherproof braid is both flame-retardant and inconspicuous. Flexibility and lightness speed installation in difficult locations.



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COLLYER Cablex speeds up wiring from meter to outlet... its small diameter and smooth, non-tacky finish facilitate "pulling". Braid is flame-resistant with conductors uniformly insulated with COLLYER Type T Resistol of high dielectric strength. Available in sizes 14 to 4 with 2, 3, or 4 conductors; sizes 14/2 and 12/2 in convenient 250 ft. cartons.



RUBBER INSULATED BUILDING WIRE

The COLLYER line of rubber insulated wire is complete. For dry locations and heat to 60°C. specify Type R; for temperatures to 75°C. Type RH; and for moist locations Type RW. Wires are available lead sheathed or braid covered, impregnated against flame and moisture, for voltages to 5,000 or higher, with sizes 14 to 8 solid or stranded, size 6 and larger stranded.



VARNISHED CAMBRIC INSULATED POWER CABLES (Type V)

These cables permit higher safe operating temperatures, up to 85°C. — carry heavier current loads with a given conductor. COLLYER Varnish Cambric insulation is well known for long life and high dielectric strength, resisting oil, ozone and heat. Available braided or lead covered, single or multi-conductor, for voltages up to 15,000.

Write for information.

Collyer INSULATED WIRE CO.

245 Roosevelt Ave., Pawtucket, R. I.

fore the program is completed, Mr. Wickard estimated that one million more miles of line must be built to serve some 3,200,000 farms. Last year, 87,000 miles were built (70 percent by contractors).

The Administrator asked for more contractor cooperation, patience and tolerance; invited them to bring their gripes to Washington; promised to halt REA's past tendency to "shoot a little too much from the hip on matters"; indicated RECA would be consulted in the future on proposed policy changes. Regarding "force account" work (co-ops building their own lines), Mr. Wickard would like to see all future lines built by contractors. Which way it goes depends upon the margin in the bidding, the wider it is, the more chance for force account work.

An insight into congressional reasoning behind the \$600,000 slash in REA administrative funds was given by Representative George Schawbe of Oklahoma. He believes rural electric co-ops are experienced enough to stand on their own feet, and direct a lot of their own work without leaning on Washington. He asserted his faith in the contract system, believes force account work is inefficient and thinks Congress would like to see contractors supply their own materials on REA construction.

D. W. Baker, REA finance division, Washington, D. C., heaped a few more hot coals in co-ops laps while discussing the slow payment problem. Some co-op managers never read their construction contracts which outline their obligations insofar as contractor payments is concerned, he revealed. Many are negligent in requisitioning sufficient funds to maintain the two-month leeway as provided in their loan contract, he added. This hesitancy (possibly due to the two percent interest on the loan) frequently finds co-ops without funds when contractor payments come due. Mr. Baker's solution lies in his office issuing specific instructions to co-op managers detailing the necessary steps to requisition funds and push through payments.

Much of the REA line construction lag has been attributed to material shortages. What this picture will be in 1948 was outlined by Guy Thaxton of the General Cable Company. Co-ops may complete 100,000 to 110,000 miles of line this year (87,000 miles in 1947), he estimated. Poles, insulators and line hardware should be available to meet this program, he asserted. Conductors may be in supply, but transformers will probably be the bottleneck. He asked for greater flexibility in material substitution for short items. Floor discussion revealed that aluminum rod has supplanted steel core as the critical conductor item. Despite an

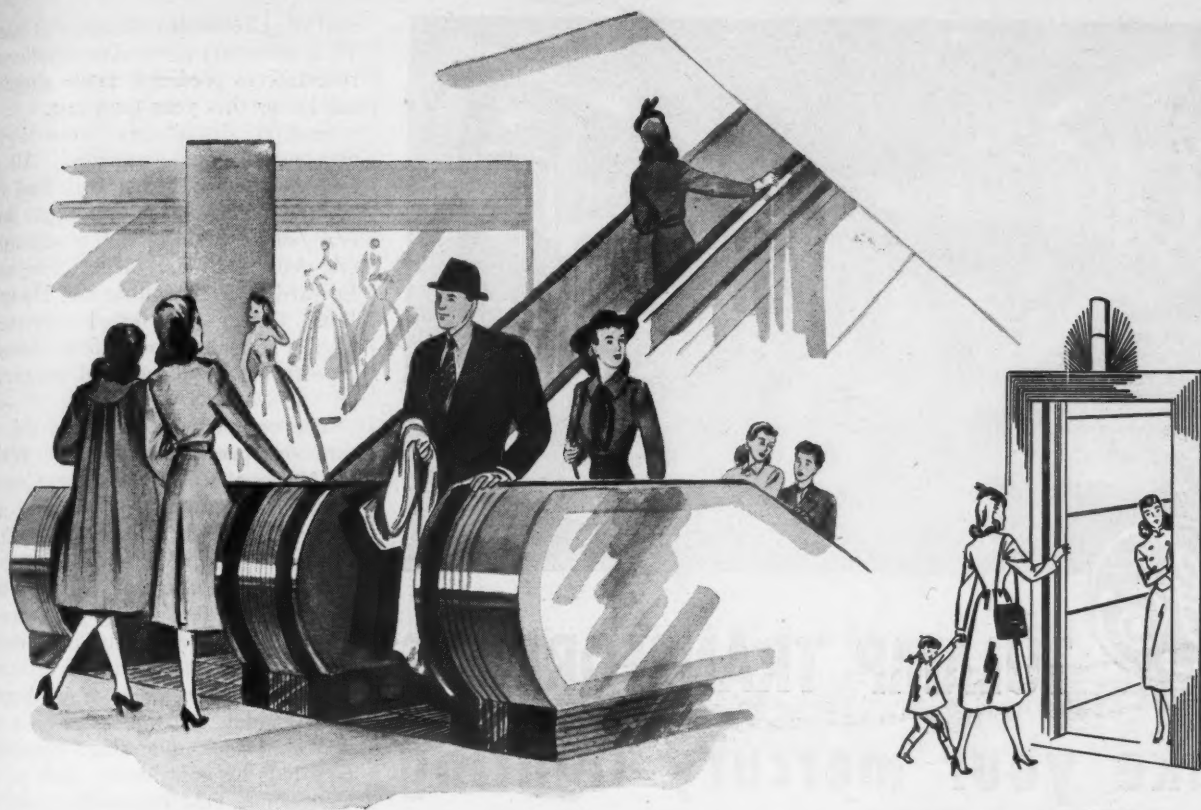
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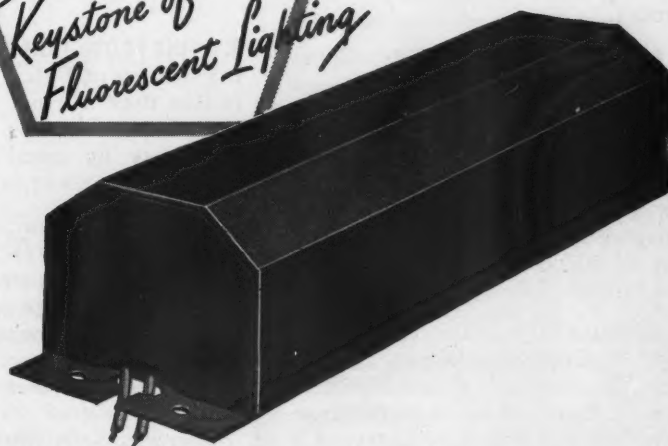
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France Insta-Start

Makes Hot Cathode Fluorescent Tops In Lighting

The instant-starting transformer originated by France seven years ago and repeatedly improved since, completely eliminates the separate starter and its maintenance. It simplifies the wiring of the fixture and stabilizes lamp performance and by providing instant light at the flick of the switch it provides the final element needed to make low voltage hot cathode fluorescent the most modern lighting for industrial, commercial and residential purposes. France Insta-Start Transformers are recommended by or available from leading fixture manufacturers if specified.



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TULAMP TRANSFORMERS make your mercury lighting COST EVEN LESS

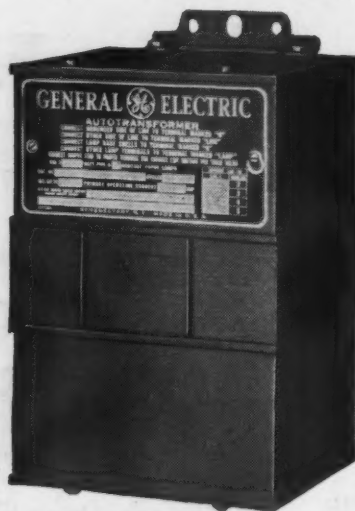
High efficiency, long life, and sustained light output make mercury lighting the economical way to obtain better lighting in more and more industrial installations. G-E Tulamp transformers for mercury lamps increase your "more-light per-dollar" advantage by cutting installation and operation costs five different ways.

1. TRANSFORMER COSTS ARE LOWER: A Tulamp transformer costs less than a pair of single-lamp transformers.

2. POWER COSTS ARE LOWER: Combining two ballast units into one transformer provides more efficient operation.

3. WIRING COSTS ARE LOWER: High-power-factor operation by Tulamp transformers saves copper. Low starting current characteristic permits further reduction in wire size.

4. INSTALLATION COSTS ARE LOWER: With Tulamp transformers, only half the number of transformers need be installed—and installation is further simplified by carrying a common ground through to each pair of lamps.



5. FUSE PROTECTION IS BETTER: Starting current of Tulamp transformers is less than normal operating current, hence fuses for circuit protection may be rated down to the operating current values.

G-E Tulamp transformers are designed for both the H-1 400-watt lamp and the H-5 250-watt lamp. For fully co-ordinated design, specify G-E mercury lamps and transformers. For information on General Electric's complete line of mercury lamp transformers, address the nearest G-E Apparatus Sales office, or Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

412-00

overall aluminum shortage (due to TVA drought) aluminum supplier representatives predicted more aluminum conductor this year than last.

Session discussions were by no means contractor-dominated. All parties involved in REA work had their say and many contractor charges boomeranged. Speaking as a consulting engineer who does REA line work, Edward Dye, Laramore and Douglass, Inc., Chicago, asserted contractors neglect to make prompt final inventory reports, have substandard supervision on line work.

The co-operatives' side of this picture was presented by Clyde Ellis of the National Rural Electrical Cooperatives Association (representing about 80 percent of all rural co-ops.) Co-ops want and need contractors in the program but feel that construction is too slow, he revealed, citing statistics that show contractors today are building about 0.3 miles per day per 100 miles of contract (prewar average, about one mile per day). Conflict between co-op and contractor planning, complimentary bids by contractors, lack of sufficient REA field engineers (one engineer for every 20 systems) and lack of funds for a year's backlog of applications for lines were other complaints.

What does REA think of the contractors' performance? J. K. O'Shaughnessy, Chief Engineer of REA, had the answer during the final session and forum. Not all of the slow-up is due to material shortage, he stated. Contractors are building only 1.5 miles of line per work week; using up to 400 man-hours per mile (prewar average, 100 man-hours per mile); have poor planning and supervision; cannot complete contracts under specified time.

Bid rejection and re-bidding of projects is due to erratic bidding by contractors, O'Shaughnessy explained citing that rebidding has saved REA borrowers more than one million dollars. Another problem is lack of competitive bidding.

RECA is fighting the "labor only" type of contract and wants material returned to the contractor. O'Shaughnessy favors this when the contractor can deliver all materials for the project. In the interim, he wants to take advantage of the co-op's ability to place material orders six to eight months prior to construction contract awards. He proposed that contractors bid labor and material on easy-to-get items, then assume the co-op's hard-to-get material orders when the job starts. Provisions for co-op materials are to be made in the contractor's bid.

Mr. O'Shaughnessy cautioned contractors against bidding jobs from "swivel chairs"; erratic bidding which may lead co-ops to force account work

(which REA doesn't want); sandwiching in short line extensions without first securing contract. He concluded with a plea for more contractors to get into REA work.

REA-RECA cooperation has led to the following changes in the construction contract: Material list simplification; proposal acceptance by REA now limited to 45 days (90, previous); contractors can splice service drop; 30-day "start-work" notice (10, previously); co-ops can now obtain 99 percent of funds for completed work without waiting for final inventory report; contractors now allowed a two percent breakage loss on all material items on labor only jobs; weekly contractor construction reports eliminated. Additional changes are expected from future conferences.

As a direct result of this meeting, a committee of RECA will meet with the National Rural Electrical Cooperatives Association in Kansas City in April. At that time they will try to eliminate much of the friction now existing between rural line contractors and co-ops.

New officers elected at the final business session are: President—R. E. Mattison, R. E. Mattison & Co., Oklahoma City; treasurer—P. F. Size, Miller Construction Co., Linton, Indiana; secretary—R. S. Shely, Shely Construction Co., Lexington, Kentucky. Three vice presidents elected are: W. A. Patterson, W. A. Patterson Co., St. Paul, Minn.; E. C. Bridges, Heath Springs, S. C.; Larry Ellett, Agutter Electric Co., Seattle, Washington.

The 1948 convention will be held at the Edgewater Beach Hotel in Chicago.

Van Cleef Reelected Association President

Felix Van Cleef, vice-president, Van Cleef Brothers, Inc., (Dutch Brand tape) was reelected president of the Chicago Electric Association at the annual meeting of the board of directors. Others elected to office for the 1948 term were: treasurer—G. L. Seaton, general manager, Illinois Bell Telephone Company; secretary—A. A. Gray.

Representing the electrical contractors on the board of directors are Oliver F. Burnett, Jr., vice-president, Kelso-Burnett Electric Co., and J. Norman Pierce, president Pierce Electric Company. M. E. Hill, president, Beverly Electric Shop and Theodore Osberg, president, Riverside Electric Company, represent the contractor-dealer group.

2

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A. C. — D. C. VOLT-WATTMETERS

... for fast-simultaneous reading of volts and watts

These two Simpson testers are designed for simultaneous reading of volts and watts. Each has two separate 3" square meters, one for volts and one for watts. Each has built-in cord and plug for connecting to line outlet, and receptacle for connecting appliance under test. There are no leads to connect. Readings register immediately when plugs are connected. Separate, uncrowded scales make quick, accurate readings easy. Each meter has two ranges, selected by separate toggle switches with positions clearly indicated by white figures recessed in the molded bakelite case. The low power consumption of these instruments and their high efficiency result in negligible loss and error in reading.



Leatherette Carrying Case—\$5.00

Model 391 (3000 watts max.)

Ranges, A.C. or D.C.

Volts: 0-130, 0-260

Watts: 0-1500, 0-3000

Size: 3" x 5 1/4" x 2 1/2"

Weight: 2 lbs.

Shipping Weight: 3 lbs.

Dealer's Net Price.....\$30.00

Model 392 (5000 watts max.)

Ranges, A.C. or D.C.

Volts: 0-130, 0-260

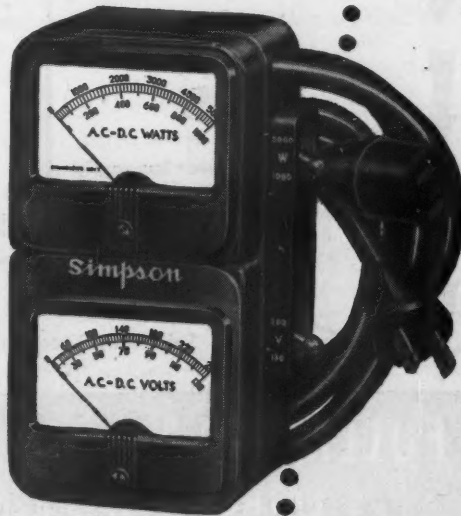
Watts: 0-1000, 0-5000

Size: 3" x 5 1/4" x 2 1/2"

Weight: 2 lbs.

Shipping Weight: 3 lbs.

Dealer's Net Price.....\$35.00



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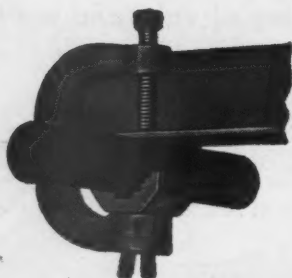
★ FLOOR BOXES ★



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"LATROBE" for LONG LIFE

The first cost of "Latrobe" Floor Boxes and Wiring Specialties is the last cost. The high quality materials and conscientious craftsmanship that go into the manufacture of "Latrobe" products are assurance of their permanent usefulness and dependability.



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Pipe or Conduit Hanger

Convenient for hanging pipe or conduit $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1" to steel beams up to $\frac{3}{4}$ " thick—or for use as ground clamp.



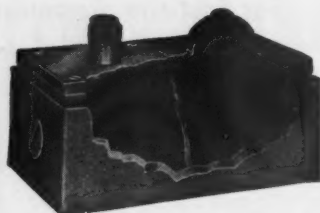
Keystone Fish Wire

Flat steel wire of high quality and properly tempered.



"Bull Dog" Insulator Support

Quick and efficient for fastening porcelain or glass insulators to exposed steel framework.



No. 252-R Floor Box

Sturdy and practical Two Gang Box with No. 208 Receptacle in one section. One Cover Plate has $\frac{1}{2}$ " Brass Plug and one has 2" Brass Plug.



No. 110 "Latrobe"
Watertight Box

Iron box body with $\frac{3}{4}$ " round Brass Cover Plate. Shown with No. 208 Receptacle and 207 Ball Nozzle.



"Bull Dog"
BX Cable Staples

Excellent quality staples. Packed in Cartons, Kegs and Barrels.

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Jurisdictional Board Established

The national Joint Board for settlement of jurisdictional disputes in the building and construction industry, hailed on the floor of Congress as an "outstanding achievement", is expected to be functioning by mid-April.

Presidents of 19 AFL building trades unions on March 11 approved the pact already agreed to in February by the Associated General Contractors and seven specialty contractors. Later, the AFL Building Trades Department's constitution was amended to substitute the new plan for the old one under which jurisdictional disputes were settled by a member of the department's executive council as referee.

A permanent arbitrator, whose decisions would be binding on both sides, was to be selected by a Board of Trustees. Contractor trustees are Edward P. Palmer, president of Senior & Palmer, Inc., New York; James D. Marshall, AGC assistant managing director; Paul M. Geary, executive vice president of National Electrical Contractors Association, and H. R. Cole, executive secretary of Tile Contractors Association of America. AFL Trustees are Richard J. Gray, president of the Building Trades; Morris A. Hutcheson, first vice president of the Carpenters Union; William O'Neill, general organizer of the Plumbers Union, and James Close, general secretary of the Sheet Metal Workers Union.

Under the plan, jurisdictional disputes not settled locally and not covered by an existing decision or agreement of record, will be referred by the Board of Trustees to the Joint Board for decision. The Joint Board will consist of the arbitrator and two industry and two labor members selected for specific cases from a pool of twelve industry and twelve labor representatives.

The agreement provides that any decision or interpretation by the Joint Board must be accepted and complied with by both sides. There are to be no strikes or lockouts.

It is hoped through the operation of the Joint Board that jurisdictional disputes will be settled without resort to the National Labor Relations Board, to which the Taft-Hartley Law has assigned the task of deciding such issues if not settled on a voluntary basis.

"The construction industry has been plagued by this type of dispute for several decades and the joint committee considers the approaching settlement of the problem there to be a major step forward." Senator Ball, chairman of the Senate-House Committee on the Taft-Hartley Law, told Congress in the Committee's Interim Report.

Pittsburgh Holds Planned Lighting Show-Conference

The Tri-State Planned Lighting Exposition and Conferences, held in Pittsburgh, Pa. March 1-4, was attended by an estimated 12,500 visitors, consisting of both members of the lighting industry and users of lamps, light and lighting equipment. Actual registration totalled 6,769 visitors. This four-day event, first of its kind ever to be held in the Tri-State area, was sponsored by the Commercial and Industrial Sections of the Electric League of Western Pennsylvania.

The latest developments in commercial and industrial lighting equipment, light sources and lighting components were exhibited and demonstrated by 47 nationally-known manufacturers. Open to the public, these new lighting products were seen, discussed and examined by store owners, industrial plant executives, engineers and office executives, building owners and managers, school administrators and public officials, electrical contractors and wholesalers, architects and consulting engineers, and others.

Supplementing the elaborate array of exhibits were a series of six conferences, an all-industry banquet, and two spectacular entertainment programs. Two of the conferences were for individual segments of the lighting industry, one for electrical contractors, and the other for electrical wholesalers. The other four conferences were technical, covering lighting for offices, industrial plants, schools and stores, and were of interest to the lighting industry and to lighting customers alike.

Wholesalers' Conference

Electrical wholesalers were told of the need for more light in the nation's stores, schools, homes and industrial plants by Harold H. Green, head of market development for the General Electric Company, Lamp Department, Nela Park. "It's up to the lighting industry and its Planned Lighting program to provide that needed light at low cost to the user", he stated, addressing the wholesalers on the subject of "Putting Punch in Your Planned Lighting Program".

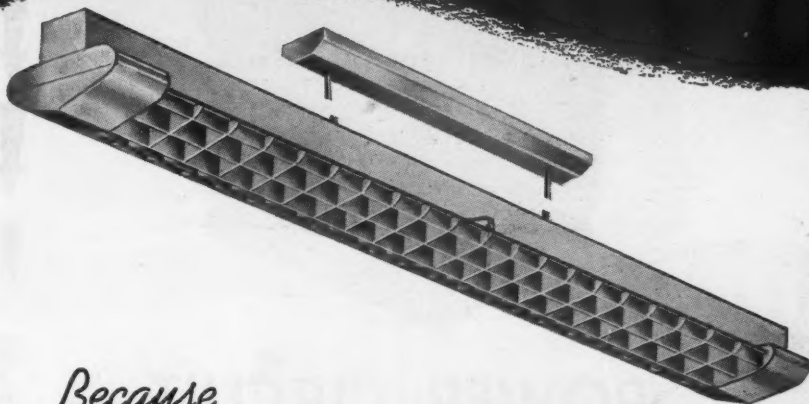
R. L. Whitney, district apparatus & supply manager for Westinghouse Electric Supply Co., Pittsburgh, told the wholesalers that a \$1.5 billion lighting market exists now, but that through proper planning and sales effort, for the lighting that is actually needed, this market becomes \$7.5 billion, five times as much, with a similar

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COLOVOLT

10,000 HOURS

Lamp Life Expectancy



Because

they give complete customer satisfaction with your job—both now and later. 10,000 hours lamp life expectancy means lower maintenance cost—lack of intermediate burn-outs—no replacing lamps during working hours. Complete absence of flicking; practically no deterioration throughout the entire life of the tube.

Because

they give an even, glare-free light that is soothing and pleasing. No spots of greater or lesser brilliance—no flicker; no stroboscopic or vibrating effect. COLOVOLT lamps start instantly, have a low surface brightness because the lumens are distributed over a longer area, give true color discrimination and lend themselves to all interior treatments.

Because

they are easy to install—operate on low voltage cold cathode ballasts or high voltage transformers and do not require special wiring or starters.

COLOVOLT Lighting Fixtures are modern in design and appearance—are easily maintained and cleaned—have less dust collecting areas—may be used with different types of diffusing glass or louvers—are all steel with an exceptionally durable baked enamel finish which retains a hard, smooth, even surface. Union made and Underwriters' approved.

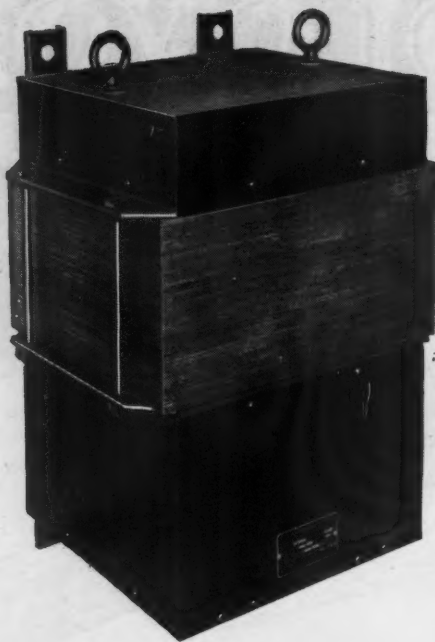
The trend is to Cold Cathode Lighting. Write or wire today for complete information.



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POWER CIRCUIT TRANSFORMERS

THE most economical way of providing low voltage circuits for the lighting and operating of machine tools is to run a branch line from the power line, using a transformer to step down the voltage.

Dongan Transformers are being used for this purpose in industrial plants throughout the nation, reducing installation time and also conserving critical materials.

Capacities up to 37½ KVA.
single and 3 phase.

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DONGAN
TRANSFORMERS

increase in wiring and installation from \$750 million to \$3.1 billion. Subject of his talk was "A Pittsburgh Wholesaler Looks at Planned Lighting".

Chairman for the Wholesalers' Conference was Douglas Wallace, manager, Pittsburgh branch, Graybar Electric Company, Inc.

Contractors' Conference

"Planned Lighting affords the qualified lighting contractor the greatest opportunity ever presented to him", electrical contractors were told by Paul M. Geary, executive vice president of the National Electrical Contractors Association, in his talk on "The New Lighting Frontier for the Contractor". After reviewing past practices of lighting manufacturers, electric utilities and wholesalers in obtaining illuminating engineering and sales talent to promote lighting on a rather lavish scale, he asked the group "Why not let's all of us get wise to reality and channel our sales and engineering effort into the most economical course for lighting progress? That means developing, supporting and stimulating the contractor as the logical man to bring the benefits of scientific research, industrial production and marketing knowledge to the customer in a way that will mean enduring satisfaction. It means the shift of illuminating engineering talent to the contractor's organization. There is where the real opportunity is", he stated.

Manufacturers and wholesalers were warned to stop pointing a finger at the contractor and calling him the villain in the lighting business when talking to customers, and were also told to stop selling around behind the contractor's back.

As for the contractor, "he simply has got to start selling", Mr. Geary said.



Two railroad men H. P. Wright (left) assistant electrical engineer, Baltimore & Ohio, Baltimore, Md., and H. C. Cross (right), Chicago Terminal Railroad Co. (B & O), discuss office lighting with J. H. Fall, III, sales manager, Benjamin Electric Manufacturing Co.

"He's got to build up an organization competent to perform the complete Planned Lighting job. Many have. Those who aspire to this business have to follow suit. There is no short cut. The road is long, hard and expensive. But the rewards are high".

In discussing "Profits PLUS From Planned Lighting", Berlon C. Cooper, eastern editor for *Electrical Construction and Maintenance*, told the contractors "The amount of profit in a lighting installation is almost directly proportional to the amount of technical lighting knowledge put into the lighting plans". This fact was demonstrated with data from a comparative cost and profit study covering three types of lighting layouts for a store. "Everyone who specifies, sells or buys Planned Lighting will profit", he stated. This was apparent in the analyses of costs and profits involved in the three examples of lighting layouts used.

The various segments of the lighting industry, the lighting market, the sales effort and engineering services offered by each, were reviewed. The need for greater cooperation between the segments of the lighting industry, and for greater support of the electrical contractor were stressed.

"Electrical contractors also have an obligation to the manufacturers, wholesalers and electric utilities", they were told. "Unless contractors DO recognize this obligation, and set up organizations qualified to do the big Planned Lighting job ahead, backed up by worthwhile budgets for their salesmen and lighting engineers, local advertising and similar promotion, then they can logically expect the lighting industry to do the job some other way. Planned Lighting offers a bigger market, with bigger profits, which will support such an activity by electrical contractors".

J. S. Schuchert, manager of commercial sales, Duquesne Light Company, Pittsburgh, told the contractors "The Planned Lighting program puts squarely up to the contractor the problem of making a decision—'To Do or Not To Do', which was the title of his talk. "'To Do' means to serve your customers properly, to cooperate with other branches of the industry, to sell lighting and, incidentally, to increase materially your business and profits", he said. "'Not To Do' in the lighting business means just to continue what many contractors have been doing. Perhaps it hasn't been their fault. Perhaps the rest of the industry hasn't done its part".

"Planned Lighting is synonymous with good lighting. It's an expression in two words which indicates that every lighting installation, regardless of size, should be planned", Mr. Schuchert explained. He urged contractors

CUSTOM INSTALLATIONS at No Extra Cost WITH WILEY STOCK MODELS



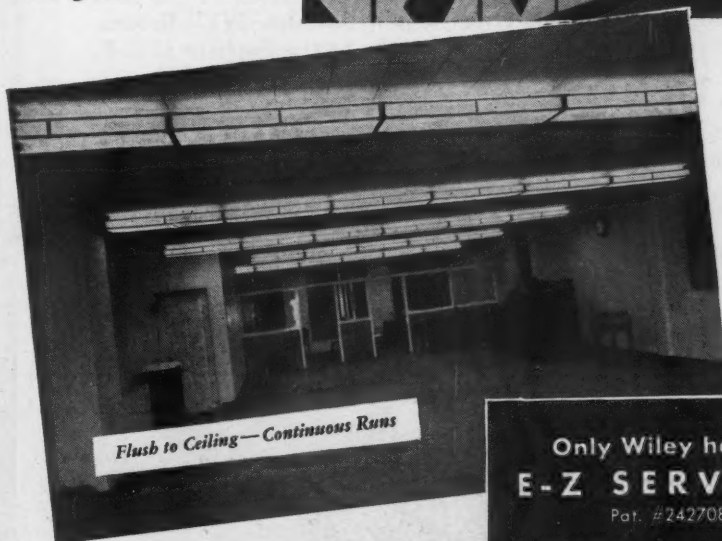
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Suspended or flush with ceiling... individual or continuous runs.

Universal Troffer in 2, 3 and 4-lamp sizes, completely assembled, may be used individually or in rows with open, louvered or glass base panels. Completely interchangeable.



Suspended—Continuous Run



Flush to Ceiling—Continuous Runs

Spot Lites... adjustable or fixed lens types... may be used individually or combined with Wiley Commercial and Troffer Models.

A complete line of quality Industrials... open, louvered or glass.

Companion Commercial Units in 2, 3, 4 and 6-lamp sizes provide various light capacities with uniform appearance.

Starter or Instant Start... certified HPF Ballasts.

Certified by E. T. L. Approved by Underwriters Laboratory.

Only Wiley has the
E-Z SERVICER

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One-man service... No Tools. Raise one side, slide sideways and drop open. Unhook to completely remove.

Write for Complete Catalog

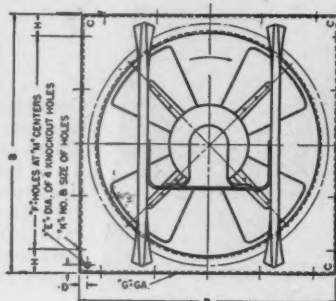
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HEAVY-DUTY VENTILATION



*Combining
simple, rugged
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CUTTING COSTS IN EVERY BRANCH OF INDUSTRY

to sell the countless benefits of good lighting, and to insist that good lighting is Planned Lighting, which will persuade the lighting customer to consider changes and make him receptive to the consideration of a quality installation.

I. R. Raphael, electrical contractor of Pittsburgh, in discussing "Our Home Lighting Frontier", stated "The contractor has the framework of an organization that can design, sell, procure, install and maintain a lighting system. Neither the electric utility, the wholesaler nor the manufacturer has such a framework. We are told that the electrical contractor is the key man in lighting, that he is the cornerstone of the Planned Lighting structure. Let's not only say he is the key man, let's make him the key man in lighting".

"The future of Planned Lighting and, in fact, the future of customer lighting satisfaction" said Mr. Raphael, "lies in developing a strong contracting group so that every community will have one or more contracting organizations equipped to do the complete lighting job; designers, engineers, sales talent, purchase experience and knowledge, installation and finally—a follow through to see that the customer is satisfied".

Walter C. Gloeckler, sales manager of Star Electric Company was chairman for the Contractors' Conference.

Technical Conferences

Four separate technical lighting conferences were held, covering office, industrial, school and store lighting. These conferences served the double purpose of providing latest Planned Lighting application and design techniques information to electrical contractors and wholesalers, electric utility representatives, manufacturers representatives, architects and engineers,



Underwriters Laboratories was represented by Karl Geiges, New York City (left), and John M. Salling, Chicago, as well as several other UL members (not shown) at the Eastern Section IAEI annual meeting in Atlantic City, N. J.

and to prospective lighting customers in each field.

Office Lighting—G. T. Morrow, vice president in charge of sales, Curtis Lighting, Inc., discussed "The New Look in Office Lighting". His talk covered modern office lighting trends, contrasting old and new methods. Lighting equipment materials and fixture designs were analyzed, and special emphasis was given to brightness-contrasts and visual environment, influenced by finishes of ceilings, walls, floor coverings and office furniture.

Don P. Caverly, director of commercial engineering, Sylvania Electric Products, Inc. discussed "Pros and Cons of Sources and Systems", as they relate to office lighting. Incandescent sources can be satisfactory for intensities up to 30 footcandles, he said, and above 30 footcandles fluorescent sources are indicated. He stressed consideration be given to brightness factor limits, and to the need for comfortable illumination.

Robert E. Grove, vice president of Ketchum, MacLeod and Grove, Inc., Pittsburgh, reported on the relighting of his firm's offices, where incandescent units were replaced with fluorescent lighting. Title of his talk was "What's in 13,200 Watts of Fluorescent Lighting".

Chairman for the Office Lighting conference was Lucian Kight, supervisor of architects and builders service, Duquesne Light Company, Pittsburgh.

Industrial Lighting—"Planning for Good Industrial Lighting" was the subject of a talk by A. Paulus, district engineer for the Lamp Division of Westinghouse Electric Corp. Advantages of various types of light sources and types of reflector equipment were discussed. Many examples of good lighting were illustrated with lantern slides.

C. W. Heppenstall, Jr., vice president of The Heppenstall Company, discussed the benefits of better lighting which had been installed in his own company's plant, in a talk on "Good Industrial Lighting Pays".

J. M. Hopkins, vice president in charge of operations for the Scaife Company, Pittsburgh, also speaking from the viewpoint of a lighting consumer, discussed "Better Lighting—Better Production".

G. E. Duerr, chairman of the Industrial Section of the Electric League of Western Pennsylvania was chairman of the Industrial Lighting Conference.

School Lighting—Research studies which show that poor lighting in schools can distort "the whole child, his eyes, his muscles, his bones, his body structure and his learning" were cited by Dr. O. H. English, superintendent of schools at Uniontown, Pa., when he addressed the School Lighting



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This protection is recognized by more and more tape users who ask for — and get — PANTHER and DRAGON. Sold only through recognized independent wholesalers. The Okonite Company, Passaic, N. J.



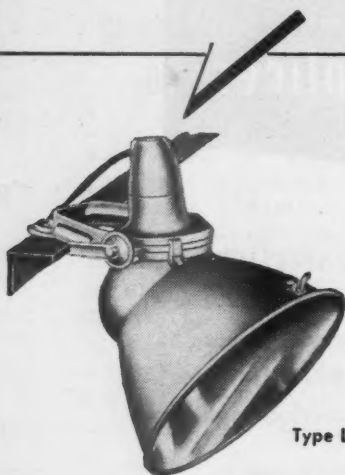
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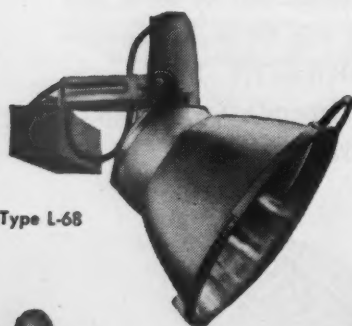
For sports and area lighting

TYPE L-69—the high efficiency unit used for Yankee Stadium, Fenway Park, Briggs Stadium. Spun-sealed, enclosed. 1000/1500 Watts. Medium and Wide Beam.

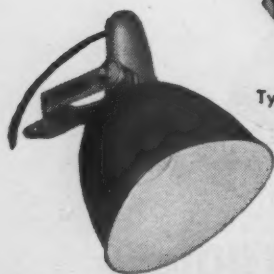
TYPE L-68, similar to L-69 with slide-type glass door, Alzak* Processed Aluminum. 1000/1500 Watts.

For low-cost area lighting

TYPE L-45 open unit. Wide beam, porcelain enamel. 300/1500 watts. Available with auxiliary internal reflector for longer range projection.



Type L-68



Type L-45

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*Manufactured under Aluminum Company of America patents.

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Conference. Title of his address was "Planned School Lighting Challenges School Administrator".

"I plead with you as power company officials to set up conferences and workshops in each of the larger communities, invite in school administrators, school board members, P.T.A. members, service club members, and leading businessmen", said Dr. English, adding "Demonstrate the importance of doing everything possible for our growing boys and girls. Some may feel that it is a commercial proposition, others will look upon a program as a service unequaled by any other organization".

"Schools have been taken for granted too long", said Dr. English. "They have been the victim of a depression period and a war period covering some 15 years, and today we find too many schools in a deplorable condition".

Dr. English estimated the needs for new school buildings and improvement or modernization of present schools in this country at six billion dollars. "A modern battleship costs over \$50 million", he said, adding "That much spent on a lot of young minds might eliminate the need for that battleship".

R. C. Putnam, associate professor of electrical engineering at Case Institute of Technology, Cleveland, discussed "New Tools and Methods in Planned School Lighting". Brightness-contrast ratios in the field of view of the pupils should not be greater than three-to-one, he pointed out. To obtain this condition requires that ceilings, side walls, floors, desks and other furniture should be finished in light colors. Mat finishes should be used on furniture, ceilings and walls to prevent specular reflections, he said. Lantern slides showing examples of lighting for school classrooms with both fluorescent



Electrical construction industry problems in Michigan are aired by O. Flener (left), Chapel Electric Co., Jackson; and B. C. Fowler, Barker-Fowler Electric Co., Lansing.

and incandescent lamps, of light color chalk boards, of curtains to be pulled over blackboards when not in use, and of various types of lighting systems were shown and discussed.

Harry Restofski, sales promotion manager, West Penn Power Company, Pittsburgh, was the School Lighting conference chairman.

Store Lighting—C. M. Cutler, engineering division, Lamp Department, General Electric Company, Nela Park discussed "Planning Store Lighting". The fundamentals of lighting for *Attraction, Appraisal and Atmosphere* were given. Lantern slides were used to illustrate examples of good and bad lighting practice, covering show window, show case, wall case, feature display and general lighting in stores.

"Sold on Sight" was the title of a talk by E. D. Atree, manager of the engineering department, Pittsburgh Reflector Company. Proper use of light, and lighting techniques used to provide good store lighting, were discussed and also illustrated with slides.

Warden H. Immel, vice president of Royer's department stores in Western Pennsylvania, gave a store owner's viewpoint of good lighting, installed according to a planned lighting layout, in his talk on "Planned Lighting Sells Merchandise".

Chairman of the Store Lighting conference was B. D. Levaux, vice president in charge of sales for Pittsburgh Reflector Company.

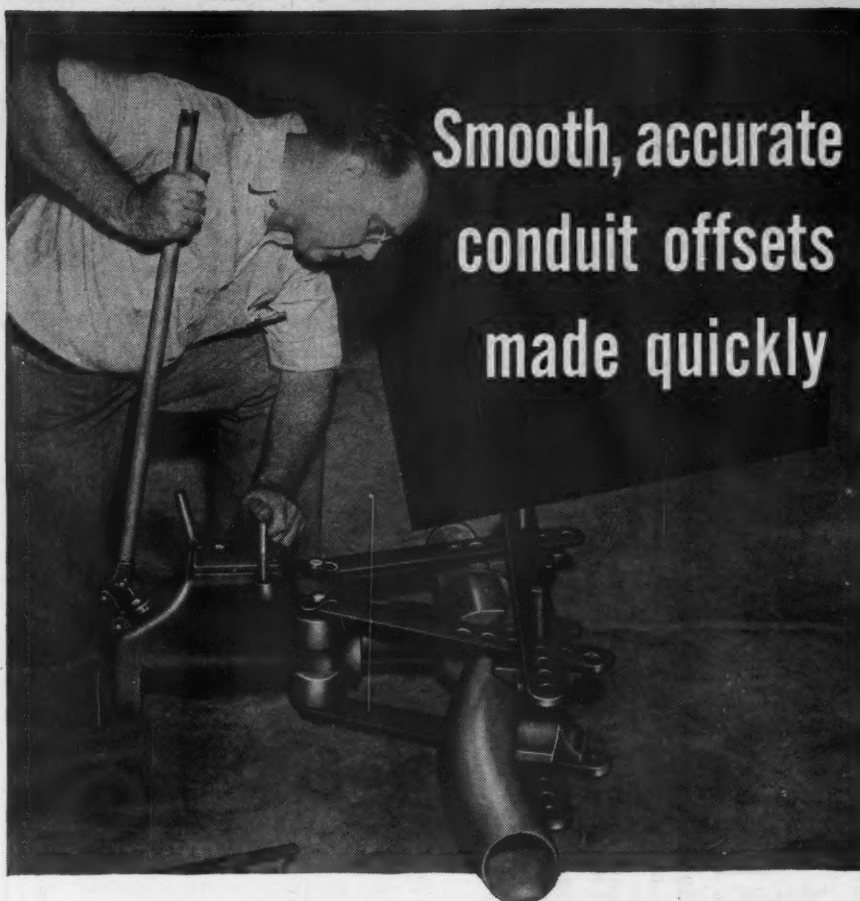
All-Industry Banquet

More than 750 members of the lighting industry attended the all-industry "kick-off" banquet on opening night of the Exposition and Conferences. Joseph S. Schuchert, originator and promoter of the Planned Lighting program idea, was the banquet chairman.

Principal speaker for this affair, keynoting the Exposition and Conferences, was E. C. Huerkamp, sales manager of the Lighting Division, Westinghouse Electric Corp., Cleveland. In presenting "A Challenge to the Lighting Industry", he warned that "aggressive effort is needed to raise the nation's lighting level". He proposed a single association, including everyone in the industry, to promote good lighting. Explaining the need for such an industry association, he cited school, outdoor and street lighting, as examples which require aggressive effort for the welfare and protection of the nation's youth.

Lighting Exhibits

On display in the demonstration booths of the 47 exhibitors were many new lighting developments not pre-



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"Big advantage of the GREENLEE Bender is that it will make any kind of offset needed in a conduit installation.

"Also the fact that this Bender is a single unit means that you can transport and set it up *right on the job* for handling various sizes of pipe."

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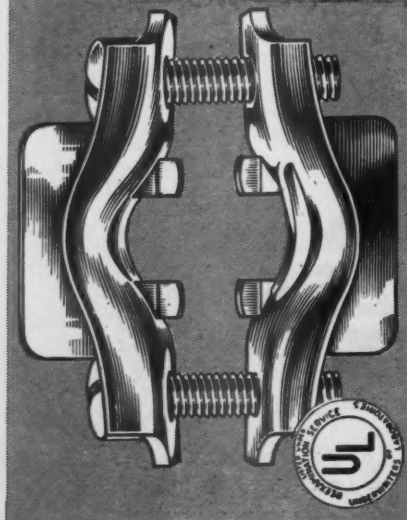
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viously seen by many of the visitors to this Exposition. These new developments included entire ceilings of plastic grill work which emit soft, shadowless and evenly diffused light from fluorescent lamps installed in reflectors concealed above, a new mercury-vapor street light, new aviation beacons, sun-lamp bulbs, germicidal units, infra-red lamps, new commercial and industrial lighting units, and a new fluorescent lamp which produces light in the color tones of an incandescent lamp efficiently at 62 lumens per watt.

One outstanding exhibit, shown here for the first time, was the Pittsburgh Plate Glass Company's store front modernization "Caravan" exhibit. Consisting of a large number of store front models, made to scale in every detail, each model displayed many typical Planned Lighting techniques in addition to novel uses of plate glass for store fronts. These models, designed to be transported "Caravan" style in specially-built trucks, will be shown in every major community across the nation, according to present plans, company officials stated.

Entertainment

Two evenings were devoted to "light" entertainment. This entertainment, open to all visitors, was both educational and "for fun". The first evening's program was presented by Westinghouse Electric Corporation. It included a thrilling exhibition of original and unusual lighting spectacles and demonstrations, by Sam Hibben, nationally famous Westinghouse lighting engineer. The Westinghouse Male Chorus and prominent KDKA radio artists gave programs of classical and popular songs, novelty numbers and harmonious melody.

The second evening program of entertainment was sponsored by the General Electric Company. Alston Rodgers, G. E. lighting engineer, demonstrated new horizons in lamp developments and research achievements. KDKA radio stars entertained with a variety of music, singing and novelty numbers.

AW Program Needs United Front

Success of the Adequate Wiring program rests on the cooperation of a united electrical industry, says T. J. Newcomb, chairman, executive committee, National Adequate Wiring Bureau. In his keynote address before the recent Fourth Annual Adequate Wiring Conference in Chicago, Mr. Newcomb warned that circuit satura-

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tion and not appliance saturation will be the bottleneck to future sales and full utilization of the electrical industry's products. He asked for a snappy slogan with a punch and the full cooperation of all phases of the industry to generate a public demand for electrical adequacy.

The major portion of the program was devoted to panel discussions on the training of AW personnel; organizing local bureaus; cooperation of electrical contractors; selling AW to home builders and existing homes. Conference consensus was that the utilities must carry the ball in the promotion program but other groups must cooperate to realize the goal. Biggest problem is lack of trained sales personnel. Some utilities are successfully using their home planning department personnel; others are training men from within their organization.

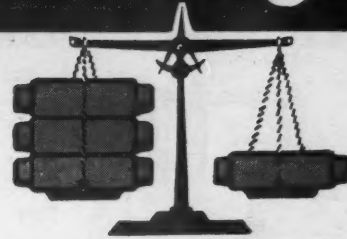
Get to know home building contractors personally, bring them into round table discussions, make them part of the AW program. That was the advice of panel members who have successfully sold adequate wiring to home builders. Biggest sales point for adequate wiring in today's high price building market is that *the home the builder constructs today will be his reputation tomorrow*. More extensive use of the package mortgage (includes heavy appliances) was recommended on the basis that a fully equipped home would automatically have electrical adequacy.

For the existing home field, extensive educational programs selling the utilization benefits of electrical adequacy are needed. Panel members agreed that the public must demand adequate electrical circuits before complete success of the AW program can be realized.

The electrical contractor is the core of the AW program and on his active participation rests the fate of the program. AW bureaus must take a realistic view of the contractor's position, stated W. T. Stuart, editor, *Electrical Construction and Maintenance*,—the only contractor representative on the panels. Contractors must make a profit to stay in business and can't afford to push adequate wiring in areas indifferent to the program. If it is choice between an AW installation or losing the job, AW will suffer. Make the electrical contractor part of the AW program. *Bureaus should not bypass him by selling wiring and talking price direct to the customer. That is the contractor's business*, Stuart concluded. Some areas reported considerable success when contractors were made members of the local AW bureau. Others found that contractors felt AW was the responsibility of the architect and builder. All agreed the program needs

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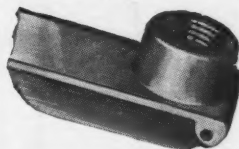
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Kondu now provides a companion line of *Threaded* Fittings, having covers and other accessories *interchangeable* with the Threadless line.

With these fittings, you can change boxes instantly without disturbing conduit—every Threadless Kondu is a *union*. Easiest to install.

USE THE RIGHT FITTING every time—the Kondu line includes one that's exactly suited. Vibration-proof . . . 100% re-usable. Write for the Kondu Catalog.

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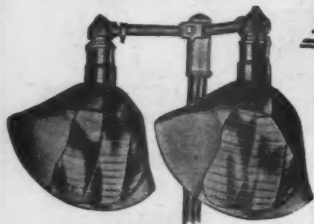
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The Threadless Fitting Line of Unequalled Variety





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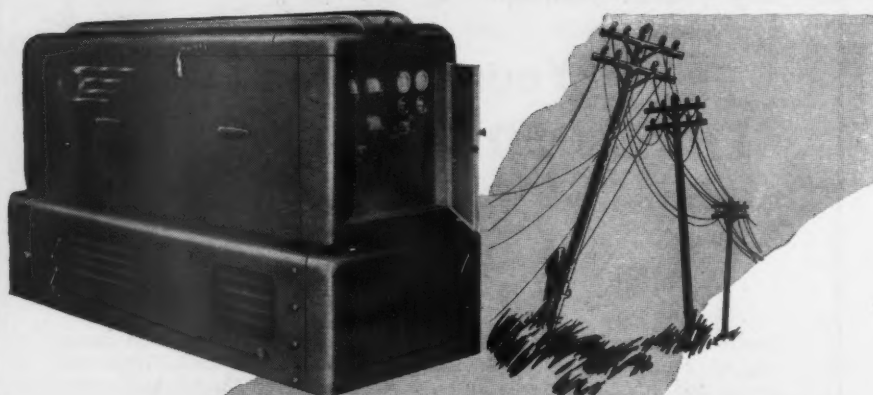
● Here is the complete line for service station lighting. Each type of unit is substantially constructed, practical in design, highly effective in illumination value, and good appearing. Send for our catalog—see modernly engineered designs that will both build your sales and assure customer satisfaction.

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more contractor support. How to obtain this still remains a problem for individual bureaus to work out.

A preview of the National Adequate Wiring Bureau's 1948 promotional campaign "Wire Now For Today and Tomorrow" was presented by Miss Frances Armin. The five point program is directed to the consumer, builder, utility, electrical contractor, wholesaler and manufacturer. Despite other economies, the AW budget this year has been increased and for the first time NAWB is running advertising in such national magazines as Architectural Forum, American Builder, Architectural Record and Practical Builder, Miss Armin revealed.

R. F. Hartenstein, The Ohio Edison Company, Akron, was general chairman of the conference. Panel members included: J. H. McGuire, Georgia Power Co.; C. M. Fife, West Penn Power Co.; M. R. Norton, Central Wisconsin AW Bureau; R. W. Neel, Cincinnati Gas & Electric Co.; G. C. Merkel, United Light & Railways Service Co.; J. J. Dore, Nebraska-Iowa Electrical Council; Miss E. A. Huscher, Oklahoma Gas & Electric Co.; F. F. McCoy, Wisconsin Electric Power Co.; H. C. Bender, Inland Empire AW Bureau, Spokane, Wash.; Herbert Snead, Dayton, Ohio AW Bureau; A. H. Jones, Madison Electric Co., Detroit; W. T. Stuart, editor, *Electrical Construction and Maintenance*; W. R. Milby, Detroit Edison Co.; P. N. Fleck, Buffalo Niagara Electric Corp.; R. W. Wilson, Kentucky Utilities Co., Inc.; R. E. Steele, Northern States Power Co.; W. C. Brown, Public Service Co., of Indiana, Inc.; H. E. Carney, The Toledo Edison Co.; and J. F. Biggi, technical consultant, NAWB.

Minn. Contractors Join Industry Meeting

More than 400 electrical contractors from Minnesota, North Dakota, South Dakota and Northern Iowa attended the electrical convention and trade show held at St. Paul, Minn., March 1-4. Sponsored by some 15 electrical organizations and coordinated through the North Central Electrical Industries, the conference and show drew a record attendance of 1,500.

The meeting marked the 20th anniversary of the Minnesota Electrical Association—an organization of contractors outside the Twin-Cities area that had its inception back in 1928 when eight men formed the Southern Minnesota Electrical Association at Faribault. During the interim, other

sectional groups throughout the state joined to form the present organization with a membership of 375. Activities of this association have done much to solidify the position of the electrical contractor and contractor-dealer in the various communities throughout the state. Better business practice; more adequate rural electrical inspection; liberalization of journeymen to apprentice ratio (now one master, two journeymen, three apprentices); the indenturing of 300 apprentices throughout the state in areas where the IBEW plan is not in effect; a continuous campaign against "bootleg" wiring; and better trade relations were but a few of the activities reported at the session. The association received signal honor by having one of its members, Sam Newstone of Montevideo, appointed president of the State Board of Electricity. Another member, Edward Linner of Stillwater, is now president of the Midwest Electrical Council, Inc., coordinating association of all Minnesota electrical contractor groups.

The Council (formerly the Minnesota Electrical Council, Inc.) now has 551 members—one of the largest regional electrical contractor groups in the nation. Its area of operations is presently limited to Minnesota, North and South Dakota, Eastern Montana, Northern Iowa, Western Wisconsin and the Upper Michigan Peninsula. The Council has now completed the cycle of operations it set out to accomplish some 15 years ago, reported secretary and former manager Wm. A. Ritt at the 16th annual meeting of that group. Much of its success as a trade association is due to the business planning and personal services it offers members and non-members in the area. About 90 percent of its activities are educational in nature and include an extensive bulletin and business form as well as credit and collection service. By making members aware of what it costs to operate, the Council has helped put the contractor "on Main Street", Ritt revealed.

Latest Council activity is the development of an advertising service to promote sales of appliances and better wiring. The value of advertising as a sales builder was clearly established by Samuel C. Gale, vice-president in charge of advertising and public services, General Mills, Inc., Minneapolis. Addressing the group, he advocated that copy: (1) be informative, educational and truthful; (2) render maximum of helpful service; and (3) seek to expand rather than shift product markets.

Council legal adviser D. M. Wakefield cautioned members against making long term commitments on short term credit from suppliers or banks;

G. E.'s New Electric Heater is easily built right into wall!

For Old Houses . . . for New Houses!

Here's one of those extra, inexpensive luxury features that people look for when they're buying a house.

It's a Built-in Electric Wall Heater, manufactured by the General Electric Company—a wonderful selling feature for any house, old or new.

It was designed with the bathroom in mind, but is installed easily in any room in the house.

Complete, this heater makes any bathroom, any room look more modern. With the snap of a switch, it circulates heat throughout the room by the radiant-convection principle.

And for a very little bit extra, a remote control switch can be attached,



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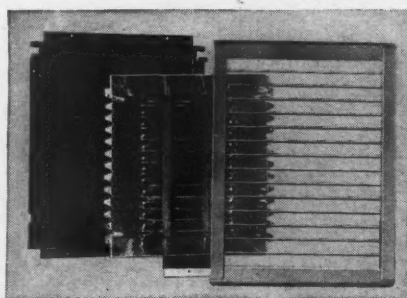
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2. Beautiful Hammertone gray finish—can easily be painted another color.
3. Fits flush with wall—guard projects only $\frac{3}{8}$ of an inch.
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6. Two long-life heating elements of nichrome wire—ceramic cords.
7. Rating—1320 watts, 115 volts, a-c/d-c, 4507 Btu.
8. Size: $17\frac{1}{8}$ inches high by $13\frac{1}{8}$ inches wide by 4 inches deep. Wall opening, $14\frac{3}{4}$ by $11\frac{1}{2}$ inches.
9. Shipping weight, 10 pounds.

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Heater consists of only three separate pieces: a wall box, heating assembly, and guard. Easy to install—instructions attached to each heater.

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It's Easy
with
HYDEE HANGER

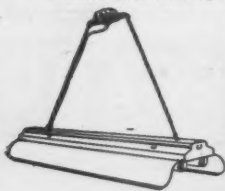
Just connect wires, screw to outlet box and your chain suspension fixture is hung—in a few minutes. All it takes is a screwdriver!

Complete with receptacle, two 5-foot chains, "S" hooks and cord clips. Fits standard 4" or 3 1/4" outlet box or plaster ring. Self-grounding—regular 2-wire cord and plug may be used. **\$1.65** each list

Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo. Nationally distributed through leading electrical supply houses.

In Canada: address all inquiries to Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

*Patent No. D-141024, others pending. Underwriters approved.

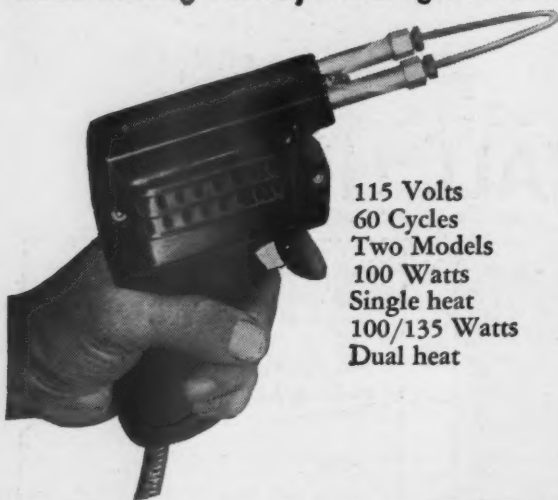
IT'S EASY TO SEE WHEN IT'S

DAY-BRITE
Lighting

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Time Saving-Money Making Features



115 Volts
60 Cycles
Two Models
100 Watts
Single heat
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Dual heat

See your radio parts distributor or electrical wholesaler. Or write direct for bulletin.

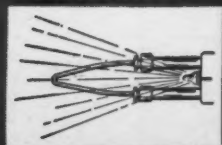
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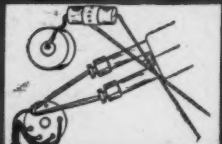
5 SECOND HEATING



ADJUSTABLE TIP



BUILT-IN SPOTLIGHT



LONG REACH



DUAL HEAT

advised them to fully investigate customer's credit and to set up income tax reserves so all cash will not be tied up in inventories when tax time comes around. He sees some tax relief next year and predicts at least two more good years for electrical contractors.

New Cable for Farms

Several all-industry sessions were held during the course of the convention. At the meeting sponsored by the Minnesota Electrical Inspectors Association and the State Board of Electricity, hazardous locations, electrical codes and wiring were discussed. Approximately 600 present (many contractors had their journeymen) heard the good news that a new type of non-metallic sheathed cable specially designed for farm building installation is on its way. For many years, the Minnesota electrical inspector group, under the leadership of Glenn Rowell, has been after the manufacturers to produce a cable that would withstand moisture and corrosive conditions in dairy and farm barns. Representatives of General Electric and Rome Cable Corp. were present with samples and test data on the new cable.

General Electric's Super PVX, recently approved by Underwriters Laboratories, has thermoplastic synthetic insulated conductors with a paper wrap, glass braid and over-all thermoplastic synthetic jacket; Rome's RoBarn has rubber and neoprene insulated conductors in an over-all neoprene jacket; is now up for UL approval. Some 600,000 feet of these two cables are now in transit to the Minnesota area and predictions indicate more than an ample supply by the end of the year.

Clarification of Article 500 on hazardous locations was made at this session. The problem now encountered in rural wiring is the extensive use of liquid petroleum which is heavier than air and hence creates a greater hazard than natural or manufactured gas fuel. Contractors and inspectors are still awaiting development of an insulated conductor for gasoline station use. Inspectors also were pleased to learn that the tamper-proof fuse question is being resolved and use of such fuses will become mandatory in the next edition of the National Electrical Code.

The highly controversial subject of single or three-phase service to farm areas was discussed at the all-industry session of the Rural Electric Equipment Council. Based on a thorough study of electric motor applications on the farm, C. H. Gelder, manager, The Dakota County Electric Cooperative, Farmington, Minn., is convinced that farm electric service is essentially single-phase in character; that no motor

over 10 hp. is necessary on the average farm. Hence single-phase lines are adequate. Those few farms that might use 3-phase service are so widely scattered that it is not economically feasible for a utility to construct 3-phase lines. Solution to the problem, Mr. Gelder believes, lies in educating the farmer to use more small motors and showing him that the lower cost of three-phase motors is more than offset by the additional cost of control equipment and wiring required.

The rest of this session was an open forum on promoting farm electric equipment. Panel discussion revealed that average kilowatt consumption in some rural areas more than doubled in the past 10 years, that averages of 7500 kwh, and more must be expected in the future. Farm equipment dealers can help the farm electrification program materially by selling farmers proper electric equipment. Wm. A. Ritt, St. Peter, believes the electrical contractor-dealer is the logical outlet since he can do the best all-around job from recommendation to service of the equipment. He sees the future electrical re-inspection program revolving itself around indiscriminate sale of electrical equipment to farms and improper, careless installations. L. G. Mample, G. E. Supply Co., St. Paul, sees a tremendous market in rural areas for electrical wholesalers, advocates development of regular sales districts to serve the farmer.

George Rietz, General Electric Company, Schenectady, and president of the American Society of Agricultural Engineers, recommended establishment of a good distribution system to channel electrical products to the average farmer; suggested the industry give actual facts and recommendations instead of talking generalities where farm utilization of electricity is concerned.

A. J. Schwantes, head of agricultural research, University of Minnesota, predicts the better farmer will become more of a professional farm manager concerned with crop planning, rotation, etc., hence will lean more heavily on service men to keep equipment in repair.

At the all-industry lighting session J. T. Coatsworth, Edison Electric Institute, presented the E.E.I. 1948 Planned Lighting Program. Carl F. Jensen, Westinghouse lamp division, Chicago, reviewed school lighting techniques; revealed that many P.T.A. groups are having modern lighting installed in a classroom as a war memorial gift.

A poor lighting job is a "lost" job in the estimation of Fred H. Heintz, Sylvania Electric Products Company. He cautioned against letting "greed"

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For Quick, Safe Cable Installation—Use EFFICIENCY NESTED CONDUCTOR RACKS



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**WEATHER PROOF
CAST ALUMINUM**



No. B-1557—
Five STONCO Flood-
lights mounted on 2"
pipe with concealed
wiring adjustable to
all angles.

STONCO Floodlights use the SEALED BEAM type lamp, in which beam and light are combined in one unit for greater lighting efficiency and economy. Result: they give more light or less current than can ever be obtained from lamps using the wasteful open-type reflectors. STONCO Floodlights are preferred everywhere for Service Stations, Sports Arenas, Industrial and Advertising Applications.

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No. B-142—
STONCO Floodlight can be used anywhere, can be mounted on a 3" or 4" outlet box. Adjustable to any angle.

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Prompt Deliveries*

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dictate the sale of a poor layout; against compromising on good lighting to cut the installation cost. Proving that good lighting can be sold, H. S. Walker, General Electric lamp department, Minneapolis, showed slides of installations in the Twin-Cities area.

During the four-day conference more than 70 manufacturers and sales organizations exhibited their products in a gigantic trade show at the St. Paul Auditorium. Products ranged from wire connectors to transformers; bed lamps to electric blankets and other traffic appliances; ranges to television sets.

At the business sessions the following officers of the various groups in convention were elected:

Minnesota Electrical Association—President—G. L. Haugland, Appleton; vice president—John Engle, Rochester; secretary-treasurer—Wm. A. Ritt, St. Peter. Field representative A. Earl Anderson was appointed manager to fill the vacancy left by Mr. Ritt's retirement from active association managership. New members of the Board of Directors are: R. J. Salfer, Mankato; Moreau Bailey, Albert Lea; L. A. McClure, Luverne; E. L. Peterson, St. James. Elected as Directors to the Midwest Electrical Council were: Sam Newstone, Montevideo; John Ellenbecker, St. Cloud; E. G. Nylund, Duluth; Ed. Karst, Fergus Falls; and Wm. A. Ritt, St. Peter.

Midwest Electrical Council—President—Edward Linner, Stillwater; vice-president—Clyde Kiely, Grafton, N.D.; secretary—Wm. A. Ritt, St. Peter. Directors on the Council Board of Directors representing member associations are as follows:

St. Paul Electrical Contractors Association—Arthur Swanson, Dave Rosecrans, Ed Hoffman.

Minneapolis Electrical Contractors Association—Dewey M. Wallin, Jerry Tripp, Charles Williams.

North Dakota Electric Contractors Association—George Hilstad, Mayeville; Clyde Kiely, Grafton; Charles Wood, Fargo.

South Dakota Electrical Contractors Association—Ivan Mathes, Aberdeen; E. M. Lothrop, Huron; Wayne True, Watertown.

Directors-At-Large include Moreau Bailey, George Jones, Curley Oien, Larry Schaffer, Paul Schorr, Lou Gordon, Don Kehne, Arthur Starbird. Representing the Council on the Board of the North Central Electrical Industries are Paul Schorr of St. Paul and Arthur Starbird of Minneapolis.

Minnesota Electrical Inspectors Association—President—Harold F. Beilke, Rochester; secretary-treasurer—Glenn Rowell, Minneapolis.

Dates Ahead—

National Association of Corrosion Engineers—Fourth annual Conference and Exhibition, Jefferson Hotel, St. Louis, Mo., April 5-8.

Edison Electric Institute—14th Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill., April 6-8.

Electrical Manufacturers Representative Association, Inc.—Annual Electrical Show, Alcazar, Baltimore, Md., April 6-8.

Midwest Power Conference—Tenth annual conference, sponsored by Illinois Institute of Technology, Sheraton Hotel, Chicago, Ill., April 7-9.

San Francisco Real Estate Board and Associated Home Builders of San Francisco, Inc.—Home Show, Civic Auditorium, San Francisco, Calif., April 7-14.

International Association of Electrical Inspectors—North Carolina Chapter, Carolina Hotel, Raleigh, N. C., April 13-14.

International Association of Electrical Inspectors—Georgia Chapter, Hotel Dempsey, Macon, Ga., April 15-16.

Home Builders Council of New York, New Jersey and Connecticut—Annual Home Show, Grand Central Palace, New York, N. Y., April 17-24.

Illuminating Engineering Society—Southwestern Regional Conference, Hotel White-Plaza, Dallas, Texas, April 18-20.

International Association of Electrical Inspectors—Florida Chapter, Hotel Floridian, Tampa, Fla., April 19-20.

National Industrial Service Association—Annual convention, Hotel William Penn., Pittsburgh, Pa., April 26-29.

Chamber of Commerce—Annual meeting, Washington, D. C., April 27-29.

National Electrical Wholesalers Association—Annual convention, Statler Hotel, Buffalo, N. Y., May 2-7.

Edison Electric Institute—Annual Engineering meetings, Edgewater Beach Hotel, Chicago, Ill., May 3-5.

Westinghouse Agent Distributors Association—Hotel Statler Buffalo, N. Y., May 9-11.

National Fire Protection Assn.—Annual meeting, Statler Hotel, Washington, D. C., May 10-13.

Electrical Manufacturer's Representatives Assn. of Michigan—Industrial Electrical Exhibit, Convention Hall, Detroit, Mich., May 12-14.

Illuminating Engineering Society—East Central Regional Conference, Mellen Institute, Pittsburgh, Pa., May 13-14.

International Association of Electrical Inspectors—Virginia Chapter, Hotel Chamberlain, Old Point Comfort, Va., May 18-19.

International Association of Electrical Inspectors—West Virginia Chapter, Parkersburg, W. Va., May 20-21.

Society of the Plastics Industry—Annual Meeting, Ambassador Hotel, Atlantic City, N. J., May 20-21.

Illuminating Engineering Society—Midwestern Regional Conference, Hotel Nicollet, Minneapolis, Minn., May 27-28.

Edison Electric Institute—Annual convention, Atlantic City, N. J., June 2-4.

Illuminating Engineering Society—Great Lakes Regional Conference, Hotel Statler, Detroit, Mich., June 16-18.

American Society for Testing Materials—Annual Meeting, Book-Cadillac Hotel, Detroit, June 21-25.

Cold Cathode Fluorescent Lighting Exhibit—Grand Central Palace, New York City, July 6-10.

American Institute of Electrical Engineers—Summer General Meeting, Palace of Fine Arts, Mexico City, Mexico, June 21-25.

Second International Store Modernization Show—Grand Central Palace, New York, N. Y., July 6-10.

International Association of Electrical Inspectors—Western Section, Denver, Colo., September 13-15; Northwestern Section, Salt Lake City, Utah, September 20-22; Southwestern Section, Oakland, Calif., September 27-29; Eastern Section, October 11-13; Southern Section, Heidelberg Hotel, Jackson, Miss., October 18-20.

Illuminating Engineering Society—National Technical Conference, Boston, Mass., September 20-24.

National Association of Housing Officials—Third annual exhibit of building and maintenance products, Olympic Hotel, Seattle, Wash., October 13-16.

National Electrical Manufacturers Association—Traymore Hotel, Atlantic City, N. J., November 8-13.

National Electrical Contractors Association—47th Annual Meeting, Roney Plaza Hotel, Miami, Fla., November 30-December 3.

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HEINEMANN SAFELET CIRCUIT BREAKER

An outlet with a pilot light that shows when circuit is in use



When you're talking to a customer, explain that this equipment, which may be conveniently installed where electrical appliances are used, means **A SAFE OUTLET AT ALL TIMES**. Plug in an electric iron, a drill or any other apparatus—the light warns you that the current is "ON." If a short or overload occurs the circuit breaker immediately shuts off the current for the particular appliance that you are using **WITHOUT** affecting the main fuse or breaker. When the condition is corrected, just flip the handle—the current is restored.

**CUTS OUT ON DANGEROUS OVERLOADS
OPENS AT ONCE ON SHORT CIRCUIT**

ASK YOUR JOBBER FOR SAFELETS

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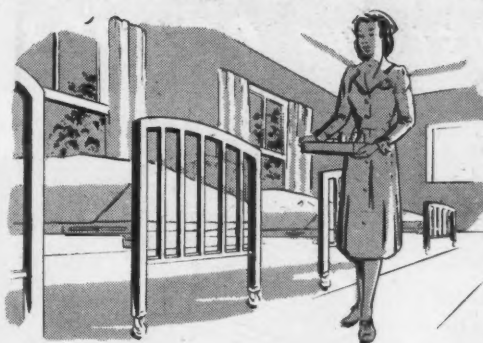


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MAKE EXTRA PROFIT by the sale of the **HEINEMANN SAFELET**. The breaker is entirely magnetic, instantaneous on "shorts", but time-delay unit permits passage of inrush current or harmless overload. **NO HEAT GENERATED.** Listed by Underwriters Laboratories.

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115 Volts—8, 10, 15 amps.
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... security for the patients in knowing that the mere pressing of a button will call the nurse when they need her ... security for the nurse in knowing that a Couch signaling system is on the job.

Regardless of your hospital's size and requirements, there's a Couch signaling system designed for your needs and engineered for 'round-the-clock service with minimum maintenance ... Nurses' Call ... Doctors' Paging ... Doctors' In and Out ... Fire Alarm ... Private Telephone ... Return Call Systems.

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—busting concrete, digging clay, shale and frozen ground; cutting asphalt and tamping backfill—with Gasoline Hammer Paving Breakers.

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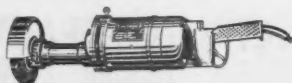
—drilling, sanding, buffing and polishing wood and metal—with Electric Drills and Sanders.

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Sturdily constructed, high quality tools—available in a variety of models, styles and capacities.

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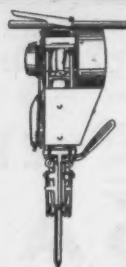
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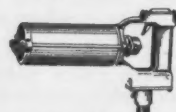
GRINDERS



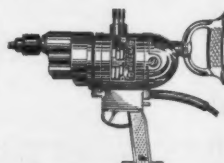
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- Threadless guard is easily installed and removed. Unique locking device keeps it from falling off, even though set screws are not tightened.

- Universal box, with plenty of wire room, has 4 hubs drilled and tapped. Plugs are furnished for unused hubs. Thus one box provides for practically all runs. No need to carry a large stock of fittings.

- 100, 200 and 500 watt types, with or without standard reflectors.

- Choice of mounting — 90° elbow, 45° elbow, pendant, outlet box or junction box.



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Manufacturers News

I. J. BARBER NAMED V. P. OF FOSTORIA

I. J. Barber, director of engineering for the Fostoria Pressed Steel Corp., Fostoria, Ohio has been promoted to a vice president.

Mr. Barber has been responsible for developing the design and technique



I. J. BARBER

for applying infrared equipment. Before joining the Fostoria organization in 1943 he was associated with electric utility companies in New York, Atlantic City and several places in Ohio.

He graduated from Penn State College in 1926 with a degree in Electrical Engineering.

W. A. COOGAN JOINS DOLPH COMPANY

Walter A. Coogan, who for the past 15 years has been director of the International Division, Sylvania Electric Products, Inc. has resigned this position to join the John C. Dolph Company as executive vice president and director.

Prior to Mr. Coogan's association with Sylvania, he was with Arcturus Radio Tube Company and Baldwin Locomotive Works of Philadelphia.



W. A. COOGAN

ELECTRO ANNOUNCES EXECUTIVE CHANGES

Announcement has been made of the appointment of L. K. Schoenbrod as vice president and general manager, of Electro Manufacturing Corporation, Chicago. He has been with Electro



C. I. SCHNEIDER

since 1939, serving as assistant general and sales manager prior to his recent appointment.

Charles I. Schneider has been named general sales manager, having previously held position as service manager and assistant sales manager during the past four years. In his new capacity, Mr. Schneider will be responsible for directing all sales activities, distribution policies, and merchandising programs.

LOUIS ALLIS APPOINTMENTS

Due to the expanding operations of the Louis Allis Co., Milwaukee, E. P. Allis, president, has announced the creation of three new offices. Elected to these new offices were Louis Allis, Jr., vice president in charge of sales; Frank O. Kovich, vice president in charge of manufacturing and T. R. Wieseman, vice president in charge of engineering.

In addition, C. G. Skidmore was appointed sales manager; James H. Daganhardt, chief engineer and John J. Kirkish, chief of electrical design.

G-E APPOINTMENTS

The organization of six divisions in the small and medium motor divisions of the General Electric Company, Schenectady, has been announced. The divisions are administrative, general sales, product sales, product engineering, product manufacturing and accounting. The following are involved in the organization—

D. E. Moorhead was named assistant to the manager of the divisions, assigned to engineering and manufacturing work.

O. F. Vea was appointed assistant to the manager of the divisions, assigned to sales work. He was also named

Bend Conduit Cold- Here's How



Conduit can be bent



to any desired angle



without moving pipe



in one operation



Installation work goes faster, easier, and at a lower cost when you have a Tal's Prestal Bender on the job. This efficient, light, portable machine handles all pipe and conduit up to 3". Makes perfect bends, up to 90°, cold, in one single operation. No need to waste labor by replacing the pipe three to six times to make a bend. Does a good workmanlike job — smooth, uniform bends without kinks or wrinkles.

Simple and easy to operate. Thousands are in successful use everywhere. Write for data bulletin.

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FULLY AUTOMATIC 2000 WATT Universal ELECTRIC PLANT



POWER FOR ANY PURPOSE!

The electric plant that "thinks" for itself! This new Universal is fully automatic. Install and you can forget it—operating doesn't require as much as pushing a button.

Providing 1750-2000 watts, 115 volt; 60 cycle AC, the plant automatically operates whenever any light or appliance of 25 watts or more is turned on. When power demand ends, the plant stops. Learn more about this and other Universal Electric Plants. There's a size and type for all needs up to 25,000 watts, A.C. or D.C., manual or automatic.

Contractors and Representatives Get the Facts on the Lucrative Universal Sales Franchise. Write Today!

Small, lightweight yet big in ability, this new Universal Model 2100-BA is entirely automatic



FREE FOLDER! Power for any purpose with a Universal for every requirement. This folder tells all about these dependable electric plants. Send now!

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Incandescent Steel
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Lamp Fixture for
shop mill, fac-
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MULTI

INDUSTRIAL LIGHTING EQUIPMENT

Right out in front to meet all Lighting Needs

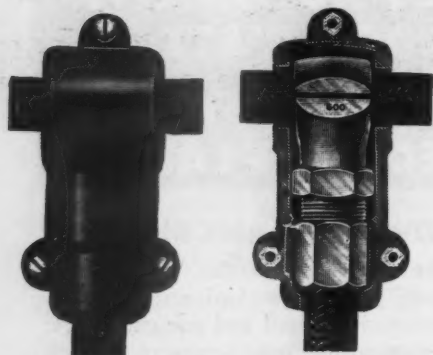
Modern lighting needs demand these practical, efficient, economical units. Better lighting installations lead to better business. Contractors are assured of always a unit for the need—no after worries—good looking finished work, when they rely on the complete Industrial Lighting Fixture line—MULTI.

• Let us send you our complete catalog.

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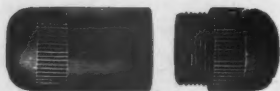
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TYPE DHT
in cover

TYPE DHT



TYPE TW

A Two-Way Connector with a Sleeve Type Compression Member. Can be readily furnished with an insulating cover as illustrated.

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HOOK TYPE CABLE TAP

Available with insulating cover for making a compact insulated connection.

A complete line of electrical connectors for tubular and flat bar bus, wire and cable conductors.

"Insist on Genuine Dosserts"

To be sure of a genuine DOSSERT make sure the name DOSSERT is on your connector.

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manager of the marketing and promotion division in the general sales divisions.

H. W. Bennett was named manager, gear motor sales divisions.

C. W. Falls was appointed manager, commercial engineering division, general sales divisions.

J. T. Farrell manager, d-c motor sales division, product sales divisions.

Elliott Harrington manager, induction motor sales division, product sales divisions.

C. C. Hutton accountant, Schenectady induction motor accounting division.

M. E. Rexford manager, standards and pricing division, general sales divisions.

The other men named were L. D. Fowler, manager Oakland motor sales division, Oakland, Calif.; L. E. Sproul, accountant, Lynn Motor accounting division, Lynn, Mass.; and D. A. Yates, manager, Lynn motor sales division, Lynn, Mass.

Four major appointments in the control divisions of G-E have been announced. M. H. Blesh has been named manager of manufacturing; C. B. Bradish, manager of engineering; E. A. Green, manager of sales; and Thomas I. Hage as accountant for the divisions.

Three recent appointments in the sales group of the specialty transformer and ballast divisions of G-E's apparatus department have been announced. P. M. Stachle, who has been associated with G-E since 1912, will head the new sales organization. C. Stonehill, formerly manager of sales of the lighting components section, is the new manager of the ballast division and H. K. Pritchard, formerly manager of sales of the general purpose components division, is manager of the specialty transformer sales division.

FEDERAL ELECTRIC PROMOTES W. W. SCOTT

The Federal Electric Company, Inc., Chicago, has announced the appointment of William W. Scott as general sales manager on regular products.

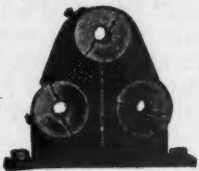
Mr. Scott has been associated with Federal for more than 20 years and since 1930 he served as general manager of the Signal Division.



W. W. SCOTT

SIMPLICITY PLUS! New NON-INDUCTIVE CABLE RACK

for
INDUSTRIAL
PLANT
WIRING



Type D-F 3-Conductor
Cable Rack. New Non-
Inductive Design. Racks
available for cable sizes
from 5/16 to 2 1/2"

● Radically different, the new M. & W. Non-Inductive Cable Rack is designed for A.C. or D.C. systems. Racked Cables only partially surrounded by metal eliminates any chance of induced current in the rack. Impedance reduced with cables mounted in delta formation. Rack of one-piece construction... installation of cables made quick and easy through the use of split bushing.

Send today for Bulletin C-5-51
which illustrates the complete line

**THE M. & W. ELECTRIC
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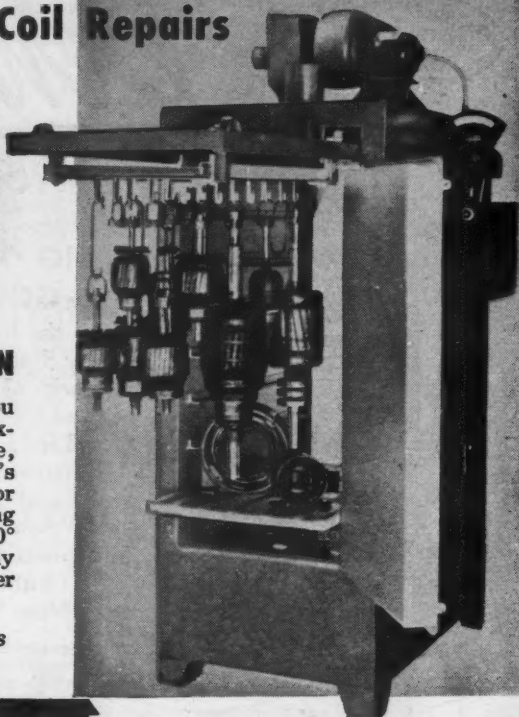
Speed up YOUR SERVICE on Armature & Coil Repairs

The job is RUSH and your customer is calling for his motor. There is where the Despatch R-S Finish Baking Oven gives you a big lift by cutting baking time in half!—and the quality will be top-notch. You can really speed up service and increase output with the

DESPATCH R-S FINISH BAKING OVEN

This oven has everything you need—positive air intake and exhaust, uniform temperature, quick pick-up after loading. It's easy to load and unload. Gas or oil fired, very economical, working temperatures from 200° to 500° F. Range of sizes, all shipped fully erected ready to use—no engineer required to set them up.

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Established OVEN in 1902
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**APRIL
NEWS FLASH**

Paine BULLETIN

**NEWS
PRODUCTION PICTURE—BRIGHTER**

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DELIVERY SCHEDULE	FLASH
TOGGLE BOLTS	—FAIR
LEAD ANCHORS	—GOOD
COILED HANGER IRON	—FAIR
SUDDEN DEPTH DRILL	—GOOD
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and HANGING
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50 HOLES IN GLAZED TILE IN 33 MINUTES

BECAUSE THE
CUTTING EDGE
is
KENNAMETAL



An electrical contractor writes: "Kennadrills drilled 50 holes 1 1/2" deep in glazed tile, at rate of 40 seconds per hole. Required no starting punch, and did not chip surface." Kennadrills go through masonry fast because their cutting edge is Kennametal cemented carbide—the metal that is far harder and more durable than tool steel. These new drills cut clean, don't bind, stay sharp under heat and abrasion. Can be used in any rotary electric drill. Available in following diameters: 1/4", 3/8", 1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2", and 1 3/4".

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DRILL MASONRY FASTER, CHEAPER, EASIER

Best Buy

FOR BIG USERS
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● Off the market during the war, this handy 5 pound can of Gold Seal Tape is back again ... the best buy for regular users. Every roll is doubly protected for factory freshness.

Whatever way you buy tape, you'll find Gold Seal always just right in "tack"; clean handling; non-raveling; non-peeling. Try it. Jenkins Bros. (Rubber Div.) 80 White Street, New York 13.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications.

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FRICTION-RUBBER

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Reflects the Craftsman's Skill



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ELECTRODYNAMIC
FLUORESCENT STARTER**

A FULLY automatic Thermal Relay (fluorescent starter) scientifically made to assure maximum economy of operation, greater reliability and more consistent performance.

A thermostatic switch equipped with silver contacts, carbon resistor and nichrome heater coil, bonded in a ceramic insulating material of high dielectric strength.

Industrial Electronics Corporation products are successfully serving industrial and commercial plants, municipalities, office buildings, stores, railroad terminals, shipyards, schoolrooms ... wherever dependable lighting is demanded.

The (SP-15-20) for use with either 15 or 20 watt lamps
The (SP-30-40) for use with either 30 or 40 watt lamps
The (SP-100) for use with 100 watt lamps

Ask for descriptive literature

INDUSTRIAL ELECTRONICS CORP.

80 Bank Street



Newark, N. J.

**AMERICAN STEEL &
WIRE CHANGES**

Wilmer H. Cordes, manager, market development, American Steel & Wire Company has been named to assume the added duties of manager of the advertising division.

Frederic H. Case, Jr. has been appointed field representative, public relations. His office will be located in the State Mutual Building, Worcester, Mass. and he will have charge of public relations activities for the company in the plant cities of Worcester, Mass., New Haven, Conn., and Trenton, N. J.

ALLEN-BRADLEY CHANGES

Donald L. Herr, formerly Lt. Commander, U.S.N., in charge of the U. S. Naval Shipyard surge project at Terminal Island, California, has become associated with the engineering department of Allen-Bradley Company, Milwaukee, Wis. He will develop servomechanisms for machine tool and other motor controls under Lynn Matthias, director of research.

New and larger quarters have been acquired for the Detroit office at 11100 East Warren Avenue. J. D. Petersen is the district manager.

**ALLIED CONTROL
REORGANIZES**

Allied Control Company, Inc., New York and Connecticut, recently had a plan for reorganization confirmed by the United States Federal Court in Chicago.

The Board of Directors is composed of Paul E. Fenton, vice president of Scovill Manufacturing Company; Huntington B. Henry, president of Ames, Emerich & Co., Inc.; Duncan MacKenzie, consulting engineer; Coburn Musser, president of the Eberhard Faber Pencil Company and C. L. Von Egloffstein, engineer.

Mr. Von Egloffstein has been elected president, James McDill, controller and J. B. Holbrook, Jr., secretary. The executive offices are located at 2 East End Avenue, New York City.

**G. F. PLATTS JOINS
CLIPPARD INSTRUMENT**

Clippard Instrument Laboratory, Inc., Cincinnati, Ohio has announced the appointment of George F. Platts as executive vice president.

Prior to joining the Clippard organization, Mr. Platts was general manager, electric products division, McQuay-Norris Mfg. Co., St. Louis. He holds the rank of Commander in the United States Naval Reserve, and during World War II served in connection with the No. 2 Secret Weapon Project.

SOLDERLESS LUG that *Speeds* the Job



See that big hex head, slotted screw? You can tighten that up with wrench, pliers, or screwdriver—whichever is at hand. No chance for the wire strands to separate. Grips them between large, serrated surfaces which insure a connection that is mechanically strong and electrically efficient. What's more, when you're done, you know the job is right.

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H. B. SHERMAN MFG. CO.

BATTLE CREEK
MICHIGAN

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ELECTRICAL CONNECTORS

CUT DAYS OFF WIRING JOBS...



WITH THE KETT TALL REACH WOOD BORER

Bores Thru Wood, Steel, and
Masonry! Does Five Day Hand
Boring Job in Less Than A
Day

• The KETT Borer solves every boring problem for electrician, plumber, etc. Eliminates ladder-climbing . . . reaches up to 10 feet above floor. Removed from extension, it's a versatile hand tool . . . boring in "hard" corners. Paying for itself on the first few jobs, the KETT Borer saves time, money, worker fatigue and accidents. Customary bits in 11/16", 12/16" and 16/16" sizes available. See your distributor for demonstration or write for Bulletin F-4.

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CINCINNATI 2, OHIO

You don't have to dig deep to find - *Revere* ELECTRIC MFG. CO. CHICAGO, ILL. Quality!

ALL THE WAY THROUGH from our exacting materials, specifications, controlled manufacturing process and finished product inspection—QUALITY is built into Revere lighting units to make them perform so well and long. Ease of wiring and maintaining are other advantages offered in—

SERVICE STATION
SPORTS — AIRPORT —
MARINE AND
INDUSTRIAL
Lighting
Equipment



Enclosed
Floods
750 to 5000
watts

Elliptor
for all
types of
mounting

Hinged
Floodlight
Pole

REVERE ELECTRIC MFG. CO.

6017 Broadway,

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WHEN YOU CAN USE

ALBANY RBR

WIRE PULLING COMPOUND AND

PULL WIRE LIKE THIS



ALBANY RBR WILL NOT EVAPORATE Easy to apply—EASIER to pull with Albany RBR. Dynamometer tests show LOWER stresses than with ordinary compounds. On-The-Job tests show higher efficiency in wire pulling at a lower cost. Albany RBR does a BETTER job with every type of covered wire and is absolutely harmless to covering. Try it once—you'll always use it.

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ELECTRICAL PRODUCTS DIVISION

ADAM COOK'S SONS, INC.

Mfrs. of Albany Lubricating Products

LINDEN, NEW JERSEY

Single Phase A. C. MOTORS

1½, 2, and 3 Horsepower
Prompt Shipment

Order one of these sturdiest of motors to-day. Every motor is subjected to a rigorous test at our factory. Manufacturers of ¼, ½, and ¾ horsepower D. C. Motors, Rotary Converters, A. C. Generators, 350 watts, to 150 KW, Motor Generator Sets and Light Plants.



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Practical guides to industrial
equipment installation—operation
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Now, save money on invaluable manuals for industrial electricians, contractors, maintenance men, and apprentices. Each gives thorough background in its subject—shows types of equipment available—gives performance, installation, operation, and maintenance data—everything to help solve problems in selection, use, and care of electrical machinery, services, and installations.

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Was \$3, Now only \$2.25
- 6. ELECTRICAL PROTECTIVE EQUIPMENT and POWER FACTOR CORRECTION**—A handbook of electrical protective and power factor correction circuits with handy tables and codes. 242 pp., over 200 illus.
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- 7. PRIMARY AND STORAGE BATTERIES**—Selection, use, maintenance of all types; also details of charging generators, rectifiers and control equipment. 168 pp., profusely illustrated.
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- 9. INDUSTRIAL ELECTRIC LAMPS and LIGHTING**—An on-the-job handbook covering all types, including fluorescent, black light and bactericidal. 342 pp., over 200 illus.
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- 10. ELECTRIC MOTORS and GENERATORS and Related Drives**—Completely covers both d-c and a-c motors of every type. 382 pp., over 200 illus.
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DURO TEST NAMES S. A. GOFF SALES MANAGER

Announcement has been made of the appointment of Smith A. Goff as general sales manager of Duro Test Corporation, Bergen, N. J.

Mr. Goff started with the company fifteen years ago in Syracuse as a salesman. Later he became assistant division manager and for the past five years he was eastern division manager.

BLACK & DECKER CHANGES

The former sub-branch of the Black & Decker Mfg. Co. at Charlotte, N. C. has been established as headquarters for a new territory comprising the states of North and South Carolina. G. M. Buchanan, former branch manager at Baltimore, has been placed in charge.

J. P. Spain, former sales engineer at Chicago, has been promoted to branch manager in charge of the Baltimore branch.

Arthur S. Boehm, former sales engineer at Pittsburgh, has been promoted to branch manager in charge of the San Francisco branch, replacing A. W. Helbush, who has resigned.

L. R. Emmert has been appointed manager of Rural Electrification of the Westinghouse Electric Corporation, Pittsburgh, Pa. He will succeed N. H. Callard, who has accepted a position with the Hilo Electric Light Company, Hilo, Hawaii.

L. M. Keating, assistant to the president in charge of distribution of the A. O. Smith Corporation, Milwaukee, has been appointed executive administrator of the company's Southwest district office in Houston, Texas. Mr. Keating replaces the late B. F. Bart.

The fluorescent tube division of Industrial Electronics Corporation, Newark, N. J., has opened a new plant at Belmar, N. J.

The promotion of three sales representatives to divisional sales managers were announced: L. A. Burr, eastern territory; J. C. Howdon, Midwest territory, and Harold F. Kless for the facturing Co., North Bergen, N. J.

Alfred S. Gartner has been appointed assistant sales manager of Solar Manufacturing Co., North Bergen, N. J.

Progressive Welder Company, Detroit, has named Joseph R. Lex as assistant general manager. Since joining Progressive, Mr. Lex has been active in both sales and engineering work.

*Speed
Wiring—
Save Tape*
with **IDEAL**
FISH TAPE, REEL
and **PULLER**



3 TOOLS IN ONE

This handy device belongs in every wireman's kit. Gives complete control of Fish Tape . . . keeps it reeled up . . . prevents springing and breaking . . . helps workman avoid "live" parts. Makes it easy to pull tape through conduit quickly without kinks or bends. No slipping. Gives a big grip. Tape is easy to reel in or pay out. 7 sizes. Ideal Fish Tapes are made of highest grade tempered spring steel wire—non-curling.

IDEAL VOLTAGE TESTER

Not an ordinary "glo" type—actually indicates nominal line voltage on easy-to-read scale, calibrated from 110 to 600 volts. **DOUBLE PROTECTION**—Combines solenoid indicator and neon test lamp. Tests AC or DC circuits. Complete with carrying case.

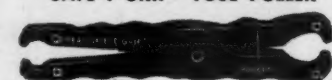


"E-Z" HAND TYPE STRIPPER and CUTTER

For solid or stranded wire. Always ready—no cocking. Triple action . . . clamps wire, cuts insulation . . . strips—all in one operation. Eliminates wire waste. Made in two models. "Automatic" has lever to stop return of arms till stripped wire is removed.



"SAFE-T-GRIP" FUSE PULLER



No Slip! Formed to fit fingers; assures positive, full grip. Safe, handy, inexpensive. Eliminates danger, prevents bending of fuse clips. Three sizes. Many uses.—**IDEAL INDUSTRIES, Inc.**, Sycamore, Ill.

IDEAL

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Popular demand means repeat business—get your share. For initial installation, or for replacement, fill your orders promptly by maintaining a full stock of all Nalco Infra-Red Lamps. Especially designed for industrial use,—for maintenance, and production drying lines, Nalco Infra-Red Lamps, with their long lasting carbon filament, and sealed reinforced base, give consistent, dependable satisfaction. Time tested and job tried. Nationally advertised.

The baking and drying favorite for

INDUSTRIAL PLANTS
AUTOBODY SHOPS
SIGN SHOPS

WOOD WORKING PLANTS
and process and production finishing in many industries.



Illustrations show Nalco Infra-Red Lamps in a variety of styles, available in either inside silvered (self-reflecting), or clear glass type (for use with reflectors)



See your Electrical Wholesaler.

NORTH AMERICAN
Electric Lamp Co.

1044 Tyler St.

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DON'T GUESS... TEST! SAVE TIME. USE THESE HANDY SERVICE INSTRUMENTS



MEGOHMER INSULATION TESTER

New Crankless Types, 500 Volts, 0-200 Megohms with additional ohm scales. Check Motor Insulation. Prevent Breakdowns. Check wires and cables.

Bulletins 435-E & 445-E.



TACHOMETERS HAND TYPES

All speeds up to
48,000 RPM

Single and Multiple
ranges. Accurate and
Dependable.

Write for Bulletin 1046-E



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For quick load checks
on AC and DC. Not just
AC. Greatest Time Saver.

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Save time and effort in winding and connecting jobs

Diagrams and connecting tables for
laying out coils and connecting them
in proper sequence for motors of from
2 to 24 poles, 2- and 3-phase

This practical manual saves your studying out connections before you begin work, and saves drawing up a new diagram every time you do a winding job by supplying the diagrams and connecting tables for all the different kinds of windings used in motors from 2- to 24-poles, two- and three-phase. It furnishes practical, step-by-step instruction on the laying out of coils for induction-motor windings and connecting the ends of the groups of these coils in proper sequence of phase and pole groups.



REPAIR SHOP DIAGRAMS AND CONNECTING TABLES FOR INDUCTION MOTORS

By **DANIEL H. BRAYMER**, Late Editorial Director, Industrial Engineer and **A. C. ROE**, Manufacturing Engineer, Manufacturing and Repair Department, Westinghouse Electric Corporation

Each one of the many scores of diagrams in this manual is a practical shop drawing, marked with proper connections for the ends of all phase groups of coils so that they can be followed by the winder when making connections.

The diagrams are accompanied by tables that give the number of coils in the different phase groups and the markings for the ends of these groups as indicated on the diagrams, to show the difference in markings for the ends of phase groups in different types of windings.

This revised edition incorporates the many changes and advances in the design and construction of induction motors through World War II. The information given here may also be used when reconnecting the coil groups to satisfy changes in voltage, changes for operation on circuits of different number of phases, different frequencies or changes in the speed of a motor.

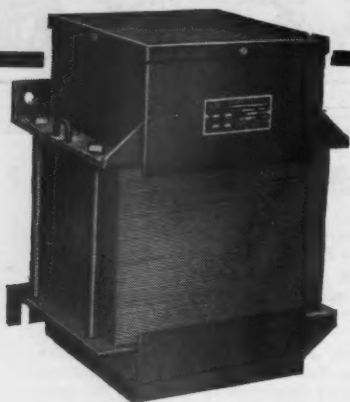
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AIR COOLED POWER TRANSFORMERS



Heavy duty design, provides high efficiency performance at normal temperature rise of 55°C. All steel construction results in more KVA capacity per pound. Acme Electric air cooled transformers are built in sizes from 1/10 KVA to 50 KVA, primary voltages up to 600 volts.

Use Acme Electric Air Cooled Transformers to

- ☐ Operate 115 volt equipment from power circuit
- ☐ Distribute power at high voltage
- ☐ Eliminate double wiring
- ☐ Provide 3 wire circuits
- ☐ Insulate circuit
- ☐ Boost voltage
- ☐ Balance voltage

Write for Bulletin E 160

ACME ELECTRIC CORPORATION
36 WATER ST. CUBA, NEW YORK

Acme Electric also manufacture: Luminous Tube Transformers — Fluorescent Lamp Ballasts — Cold Cathode Lighting Transformers and Ballasts — Radio and Television Transformers — Electronic Transformers — Door Bell, Chime and Signaling Transformers — Voltage Regulating Transformers — Stepdown Transformers.

Acme Electric
TRANSFORMERS

W. C. Robinson, president, announced recently that **National Electric Products Corp.**, Pittsburgh, has purchased the Torrance, Calif., plant of Joshua Hendy Iron Works. This California plant will be operated as a branch of the National Electric Ambridge factory.

Lewis Gordon has been appointed director of the International Sales Division of **Sylvania Electric Products Inc.** He replaces Walter A. Coogan who has resigned.

The **Standard Transformer Company** of Warren, Ohio has announced the appointment of F. W. Knoeppel of 1713 S.W. 9th Street, Miami, as its sales representative in the state of Florida.

The **Southwestern Company**, Security Building, Phoenix, Ariz., has been named to handle the Standard transformer line in the states of Arizona and Utah.

Fluorescent Fixtures of California, 2779 Folsom Street, San Francisco, has opened its new plant at 1318 S.W. First Avenue in Portland, Oregon.

Manufacturing operations at the Portland plant are in charge of John Potts and sales are supervised by Joe Blonder.

Pennsylvania Transformer Company, Pittsburgh announces the appointment of Rush F. Young as manager of the Pittsburgh sales district. Mr. Young's offices will be located at 808 Ridge Avenue, North Side.

Pennsylvania Transformer has opened a sales office at 25 Broad Street, New York City. E. S. Banghart has been named manager of the New York district.

The **Wagner Electric Corporation** of St. Louis, Mo. has announced the transfer of Fred Pasher from manager of its Cleveland branch to manager of the Dallas branch. He replaces the late B. B. Pierce.

Elmer Gent, automotive salesman in the Pittsburgh area, has been named manager of the Cleveland branch, succeeding Mr. Pasher.

The **Pyle-National Company**, Chicago, has announced the appointment of Thomas J. Little as eastern sales manager, with offices in Grand Central Terminal, New York City.

Allis-Chalmers Mfg. Co., Milwaukee, has named David R. Boise as manager of Amarillo district office. He was formerly with the San Antonio district office.



**IN ADDITION TO GIVING
YOUR CUSTOMERS
"WARM COMFORT QUICKLY"
THE FAN-GLO HEETAIRE
GIVES YOU MORE PROFITS!**

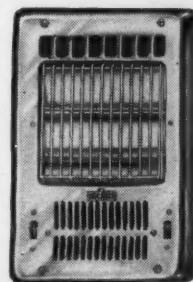
● The 230 Series Built-In Wall FAN-GLO HEETAIRE is the *only* recessed heater built that gives you—and your customers—everything.

● It gives your customers WARM COMFORT QUICKLY—the *only* recessed heater built that gives both kinds of heat—abundant infra-red plus abundant fan-forced heated air. Its infra-red rays heat all the humans in the room—*quickly!*

● It gives you MORE PROFITS! Because it's backed by *powerful selling ammunition*—a dynamic convincing "Best Seller" sales manual . . . plus a veritable arsenal of new literature—catalog and specification sheets and charts . . . plus national magazine and newspaper advertising that drives home to millions of prospective customers the fact that FAN-GLO HEETAIRE is the *only* heater built that gives BOTH kinds of heat!

● Call your jobber—he's all set to help you make more sales—more profits.

**Only the
FAN-GLO
HEETAIRE
has ALL these
features:**



- Infra-Red Rays
- Patented Neo-Glo Elements
- Fan-Forced Heated Air
- Exclusive Two-Heat Feature—choice of HI-LO Heats
- Non-Rust Casing
- Asbestos Lined Casing
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- Underwriters Approval
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MARKEL ELECTRIC PRODUCTS

LA SALLE LIGHTING PRODUCTS
147 Seneca St. Buffalo 3, N. Y.

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Equipment, Materials, Services and Supplies for
Electrical Construction—Maintenance—Repairs

ELECTRICAL SUPPLIES

(all UL approved)

... B.X. CONNECTORS, single screw and lock-nut type. Bulldog strength... 4.45 per 100

DUPLEX RECEPTACLES	List price	Our price
Circle F. cat. #134.....	.25	.12 ea.
G. E. cat. #2497.....	.32	.23 ea.
G. E. cat. #2879.....	.40	.27 ea.

TOGGLE SWITCHES, single pole

G. E. cat. # M252.....	.32	.23 ea.
G. E. cat. #3498.....	.40	.27 ea.
G. E. cat. #3499 (3 way).....	.56	.38 ea.

... PLATES, duplex receptacle or toggle switch.
Brass 5¢; BR. Plastic 6¢; Iv. Plastic 9¢;
Chrome 11¢.

... B.X. CABLE, finest grade, 250 ft. coils—
4.9¢ a ft.

... Need anything electrical??? We have it.

Prices cheerfully quoted via telegram...

TIK ELECTRIC COMPANY

"In the heart of the Electrical Belt"

294 Washington St., Orange, New Jersey

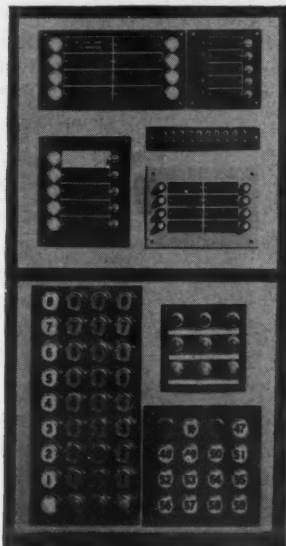
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WITH OR WITHOUT

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SPECIALIZING IN SIGNAL SYSTEMS
SINCE 1918. INVESTIGATE.

Prices on request.

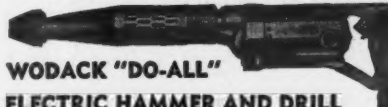


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WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and labor installing expansion anchors. Two motions—reciprocal for hammer drilling—rotary for twist drilling. Drills masonry to 1 1/2" dia., metal 3/4". Easy to maintain. Universal motor, runs direct from lamp socket. Weighs 15 lbs. Star drill in 17 diameters. Also chisels, ball points, etc. Ask for Bulletin 442 EC.

Wodack Electric Tool Corporation

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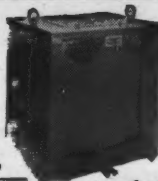
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TRANSFORMERS

for every industrial application

We invite inquiry on all of your air-cooled transformer requirements.



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TRANSFORMER CORP.

Manufacturers

Successors to Electric Power & Constr., Inc.
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Are YOU Winding Motors in a Modern Manner?



STATOR HOLDERS ARMATURE HORSES DE-REELERS SKEIN WINDERS

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supplements other advertising in this issue with these additional announcements of products and services essential to efficient and economical operation, maintenance and service. Make a habit of checking this page, each issue.

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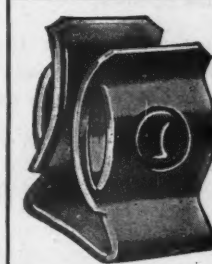
ILSCO LUGS AND CONNECTORS

ILSCO FUSE CLIPS

BELONG

IN YOUR

PRODUCTS



because of these points of superiority:

- special alloy material selected for spring, strength and high conductivity
- arched bottom assures secure mounting and prevents expansion or distortion
- rounded corners
- four "line point" contact to assure perfect fit for fuse and rigidity to maintain required pressure
- 12% cooler by test
- attractive prices

ORDER TODAY... IMMEDIATE SHIPMENT

Write for 54-page illustrated catalog with full mechanical details.

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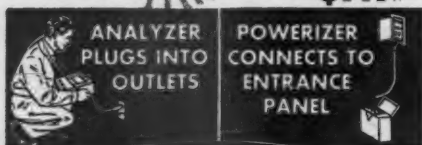
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**Inspectors
can now spot
Wiring Faults
INSTANTLY!**

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Only
\$149.50



WIRING ANALYZER

- Checks new or old wiring systems under simulated load conditions.
- Identifies each outlet circuit number and polarity.
- Instantly detects fire hazard hidden faults due to bad splices, corroded connections, wrong size wire, etc.

Consists of two units—(1) *Powerizer Source* which attaches to entrance panel to supply simulated load current, and (2) *Special D'Arsonval, rectifier meter* with dial calibrated with 4 separate scales to show Circuit Identification, Insulation Resistance, Ground Resistance and A-C Volts. Merely turn Range Selector knob for the scale desired.

No city electrical inspector can afford to be without this revolutionary test unit. Approved and used by leading fire and electrical inspectors in major cities. Only \$149.50

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Address

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(Sent open account to approved credit)

OUTDOOR SPORTS AND RECREATION LIGHTING TECHNIQUES

[FROM PAGE 84]

1. When the game is played on a separate field, lighting is treated in the same manner as lighting for a baseball field, except that the requirements are not so exacting. Three types of lighting are recommended: Class A for league games; Class B for regularly scheduled games not of league standing; and Class C for ordinary playground games. Class C layouts are considered minimum lighting for softball. Table III gives complete data on all three classes of lighting, based on the three layouts shown in Fig. 1.

Basketball—Eight wide angle open or enclosed type floodlights are recommended for lighting an outdoor basketball court. The floodlights should be mounted on 30-foot poles located as shown in Fig. 2. General service 1000 or 1500 watt lamps should be used, and operated at rated voltage.

Volley Ball—Four wide angle floodlights, either open or enclosed types, equipped with 500 watt general service lamps, are recommended for lighting a volley ball court. These units should be installed on two poles each 25 feet high, one on either side of the court at the center, and located four feet outside the sideline (Fig. 3).

Badminton—Four 500 watt wide angle open or enclosed floodlights, installed on two 25-foot poles each located four feet outside the side line of the courts (Fig. 4), are recommended for badminton courts.

Floodlights should be adjusted for uniform light coverage in all cases.



During their quest for lighting information at the Chicago exposition, I. A. Naman (left) consulting engineer, Houston, Texas; and H. E. Fraser, Langford Electric Co., Minneapolis contractor, quiz Albert Schulman of the Pearl Lighting Corporation.

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